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MOSQUITOES OF THE GENUS TRIPTEROIDES IN THE SOLOMON ISLANDS

By John N. Belkin

INTRODUCTION

From a biological standpoint the Solomon Islands were very poorly known at the beginning of World War II. The flora of the northern Solomons was investigated by German workers in the nineteenth century, but our knowledge of the botany of the Solomons as a whole is still extremely fragmentary. In the Animal Kingdom, the work of Mayr et al. (1931 ff.) on the birds collected by the Whitney Expedition stands out as the only really thorough large-scale investigation undertaken in this part of the world. In no other group of animals do we have anything but inklings of the Solomons' fauna. Yet this group of islands occupies an extremely interesting position in the dispersal of Papuan forms into the islands of Polynesia. The latter are much better known faunistically, but little can be done about interpreting the origin of their animals until the Solomons are better known. Except for small groups, the insects of the Solomon Islands were practically unknown at the beginning of the war. The mosquitoes were probably as well known as any other family, but only 29 species and subspecies had been reported (Paine and Edwards, 1929) from the entire group.

During the war many entomologists were stationed in the Solomons and were able to accumulate large collections of mosquitoes and other

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insects. I spent 21 months on Guadalcanal Island and during that time conducted a systematic survey of the mosquito fauna of the coastal region. About 20,000 specimens of adults and probably an even larger number of larvae were preserved during this investigation. About 70 species were found on this island alone. Almost every species was individually reared, so that now we have definite correlation between adults and immature stages. Other workers accumulated large collections, particularly on the New Georgia group and on Bougainville Island. A large share of this material has been available to me for study.

I have undertaken to monograph the mosquitoes of the Solomon Islands. In collaboration with several other workers, I have already reviewed the anophelines of this group (Belkin, Knight, and Rozeboom, 1945). The present study is the first in a series on the culicine mosquitoes. With the amount of material available and the large percentage of new species, it will take several years to cover thoroughly all the culicines. The genus *Tripteroides* has been very poorly known in the Solomons, as well as in the rest of its range, until 1946. The Solomons species are reviewed here from a taxonomic and ecological viewpoint. In all probability only a small percentage of the actual fauna is now known when one considers that only the coastal areas have been investigated. It is hoped that this study will stimulate more active collecting in the Solomon Islands and that eventually we shall have a thorough knowledge of this extremely interesting genus.

I wish to express my gratitude to Prof. Robert Matheson, who has encouraged and directed my interest in mosquitoes, who has given me much advice, and under whom this study was carried out. To Dr. Alan Stone, of the United States Bureau of Entomology and Plant Quarantine, I am much indebted for innumerable favors while I was overseas and during the course of this investigation. I wish to thank, also, Dr. Edward A. Chapin, curator of the division of insects, United States National Museum, for the loan of valuable material. The men of the 420th Malaria Survey Detachment collected much of the material forming the basis of this work. I am particularly indebted to the following members of this organization for their faithful work and help in carrying out the mosquito survey of Guadalcanal: Arthur W. Barnes, Jr., Murray Cohen, Stanley B. Civinski, James J. Cuccio, Charles S. Hollingshead, Louis J. Lipovsky, Edward J. McCormick, Jr., Vernon R. Roa, Henry F. Sexauer, Leo K. Walukas, Eric C. Winkler, and Francis B. Wysocki. I wish to thank, also, John G. Franclemont for his gift of a large collection of mosquitoes from the New Georgia group and for ecological notes.

THE SOLOMON ISLANDS

The Solomon group is an archipelago of the southwestern Pacific Ocean forming an irregular double chain of seven large islands and a great number of smaller islands. This archipelago appears to be an extension of the Bismarck Archipelago, which includes the Admiralty Islands, New Ireland, New Britain, and several smaller island groups. The Solomons extend from northwest to southeast for a distance of approximately 600 miles between longitude 154°40′ and 160° 30′ E. and between latitude 5° and 11° S. The total land area has been variously estimated but is likely in the neighborhood of 15,000 square miles. These islands probably never were part of a continental land mass, as they are separated from neighboring island groups by depths of ocean in thousands of feet, and even individual islands, although separated by narrow channels, are demarked by very deep water. There is good evidence, in the form of coral ridges and plateaus on the large volcanic islands, that, in recent times, an uplift of about 1,500 feet has taken place. Thus, the Solomons are apparently oceanic islands that have derived their fauna and flora from the Papuan of New Guinea. The channels separating the various islands from one another and the first channel between New Guinea and New Britain are usually less than a hundred miles wide, but they have formed efficient barriers. We find that progressively the fauna, at least, becomes poorer and poorer as we go eastward. The sharpest reduction occurs between New Britain and New Ireland, as a group, and the northern Solomons.

The larger islands of the Solomons are mountainous, reaching altitudes of 10,000 feet on Bougainville and 8,000 feet on Guadalcanal. Two active volcanoes are present on Bougainville. Savo Island, near Guadalcanal, has been active since the discovery of the group. These mountainous islands have narrow, flat coastal areas, which are best developed on the north coast of Guadalcanal and the southwest coast of Bougainville. Many of the smaller islands in the group are almost entirely of coral formation.

The native population is of Melanesian stock. Some of the outlying islands, particularly Rennell and Sikiana (Stewart), which are considered part of the chain by some authorities, are inhabited by Polynesians. Europeans were very few in number before the war. Little change has occurred in the Solomons since Guppy (1887) gave his interesting account of the life of the natives, or even since the original discovery of the group by Mendaña in 1567.

The islands are covered with dense virgin vegetation broken in a few places along the coast by coconut plantations. The climate is typical of the tropical islands of the Pacific. The rainfall is quite variable, extremes of 70 inches and about 300 inches a year being reported from different localities on one island. There is a more or less

definite rainy season lasting from November to April, but the rainfall during the dry season is usually considerable. Extremely dry conditions for periods of about a month have been noted on Guadalcanal.

One other feature of the Solomon Islands must be mentioned because of its effect on the mosquito fauna. The large mammals are represented only by the Papuan pig, a few domestic cattle, and man. The other mammals are a few species of small marsupials, several species of rats, and a fairly large number of bats. The only other source of vertebrate blood for mosquitoes in the area is to be derived from birds and reptiles, which are much more numerous than the mammals. As a result, only a small proportion of the mosquito species of the area attack man and a large proportion probably derive their blood-meals from birds and lizards.

During the war mosquito collections were naturally restricted to the occupied portions of the islands because of the lack of transportation and the difficulty of travel in the jungle. Guadalcanal Island was more extensively collected on than any other, but even there almost all the collections were made on the north and northwest coasts from sea level to elevations of a few hundred feet and perhaps 4 miles inland, in an area of less than 60 square miles. This island is about 90 miles long and 25 to 35 miles in width, with the greatest portion mountainous and inaccessible. In the vicinity of Guadalcanal, a few collections were obtained from Malaita, the Florida group, and the Russell group. This assemblage of islands, together with Guadalcanal, may be called the eastern Solomons. In the central Solomons intensive collecting was done in the New Georgia group. The Munda Point area, at the western end of New Georgia Island, was thoroughly collected. Additional records were obtained from smaller islands nearby: Arundel, Kolumbangara, Rendova, Sesavele, and Roviana Islands. A less extensive collection was obtained from Segi Point at the eastern end of New Georgia. In the northern Solomons, Bougainville, the largest of the islands in the group, was thoroughly covered in an area of a few square miles in the Cape Torokina district in Empress Augusta Bay. Sterling, the small island in the Treasury group south of Bougainville, provides the only other mosquito specimens from the northern Solomons. The map (fig. 31) indicates the localities where collections were made in the Solomons during the war.

HISTORICAL REVIEW

The mosquitoes of the Solomons were entirely unknown until 1924, when Edwards reviewed the mosquitoes of the Australasian Region, mentioning six species from the Solomons with two novelties, one being *Tripteroides solomonis*. In 1925 Edwards added two new species, one of which was *Tripteroides distigma*, and four new records; in 1926 the same author added eight species, including *Tripteroides*

FIGURE 31.—Map of Solomon Islands, showing localities where mosquitoes were collected during period of World War II

quasiornata (now *Tripteroides lipovskyi*). Paine and Edwards (1929) added ten more species and subspecies to the Solomon fauna, including *Tripteroides filipes* (now *Tripteroides mathesoni*). From that date until 1944 no published work appeared on the mosquitoes of the Solomons. Since the entomologists in the armed forces began collecting in this area, several papers have been published describing new species: Farner and Bohart (1944), Belkin and Schlosser (1944), Stone and Bohart (1944), Owen (1945), Belkin, Knight, and Rozeboom (1945), and Belkin (1945). The *Tripteroides* of the area were not touched until 1946, when Lee briefly mentioned them in his revision of the Australasian members of this genus.

MATERIAL AND METHODS

MATERIAL

This study is based on material collected by myself and associates on Guadalcanal Island. All individually reared specimens from the Solomons are part of this collection. Representative series have been deposited in the United States National Museum, Cornell University, the British Museum, and the Museum of the Council for Scientific and Industrial Research, Canberra, A. C. T., Australia. A large collection from the New Georgia group, principally Munda Point and adjacent islands, was made available to me by John G. Franclemont. The remainder of the material studied came from the collections of the National Museum and originated on Guadalcanal, Bougainville, Sterling Island in the Treasury group, the Florida group, and the New Georgia group. The following numbers of specimens were studied: 90 individual rearings of five species; 743 adults of seven species; 243 pupae of five species; 893 larvae of eight species—a total of 1,879 specimens.

COLLECTING METHODS

On Guadalcanal a systematic survey of the mosquitoes of the coastal area was undertaken as an adjunct to the malaria-control activities. This survey continued without interruption from October 1943 through the middle of May 1945. Larval collections were made in as many breeding habitats as possible throughout this period in order to obtain a representation of as many species as possible at all seasons of the year. Notes were taken on the more obvious ecological factors in the breeding places on a standard form (fig. 32). This larval material was reared in the laboratory as outlined below. The adult collections consisted primarily of almost daily catches at lighted, screened, and unscreened quarters at various times in the evening and at night. Daytime collections in open areas, as well as in the jungle, and in dwellings were also made periodically. Other collections were obtained from natural daytime resting places.

MOSQUITO SURVEY OF GUADALCANAL
20th Malaria Survey Unit

20 MSU

_____ Number Collector _____ Date _____

LOCATION OF PLACE SURVEYED _____

_____

DESCRIPTION OF BREEDING PLACE _____

_____

TYPE _____ SIZE _____ DEPTH OF WATER _____

CONDITION:

Water - - - 1. clear 2. turbid 3. colored 4. foul 5. running
6. stagnant

Cover - - - 7. grass 8. cane brake 9. Lemna 10. scum 11. algae
12. brush 13. trees 14. flotage 15. none

Light - - -16. full 17. partial 18. deep shade

Location- -19. coconut grove 20. grassy area 21. cleared jungle
22. second growth jungle 23. deep jungle 24. swamp

REMARKS: _____

_____

SPECIES CAPTURED _____

_____

FIGURE 32.—Standard form used in mosquito survey of Guadalcanal, 1943–45.

REARING METHODS

Larval collections were reared in the laboratory as follows: Each collection from a distinct breeding place was given a lot number, and all specimens were labeled with this basic number. Each lot was subdivided into sublots, one sublot for each species that could be recognized. As time permitted, full-grown larvae from each sublot were segregated in individual rearing containers. The cast larval and pupal skins and the adult emerging from the latter were all given the same 2- or 3-digit sublot number; in each case the first left digit following the lot number represented the general sublot. By this method the results obtained were threefold: (1) Correlation of adults with larval and pupal skins, (2) association of whole larvae and pupae with adults through a comparison with the individual rearings, (3) association of species in a breeding place. It is obvious that adults can be positively associated with their immature stages only by means of such individual rearings or by rearing larvae from eggs laid by a single female (progeny rearings). Mosquito larvae and

pupae do occur in pure cultures, but associations based on the supposition that there is only one species in a given collection are dangerous, since we know that morphologically similar species (sibling species) may occur in the same habitat. Progeny rearings are even more laborious than individual rearings and are not entirely satisfactory, as the immature stages are subjected to artificial conditions for a long period of time. The specimens obtained from such rearings frequently lose many of the hairs and are generally weaker than those obtained from individual rearings of wild larvae. On the other hand, this method offers the opportunity to study individual variation within a single "family." Ideally both methods should be used in studying variation in populations of mosquitoes. This was done with only a few species on Guadalcanal because of the difficulty of obtaining gravid females in the field or inducing them to take a blood meal. All specimens reared in the laboratory except predaceous forms were reared on a combination diet of powdered C–ration biscuit, yeast, and dried blood proteins.

PREPARATION OF MATERIAL

Sufficient time was not available to mount the majority of the larval and pupal skins immediately following the rearings. The most satisfactory method of preservation was found to be storage of the skins in 50-percent ethyl alcohol. Specimens remaining in this preservative for two and a half years made satisfactory mounts. But it must be stressed that to obtain good skins it is necessary to pick them out of the breeding containers within a few hours after ecdysis.

The cast skins or pelts, as they are sometimes called, were mounted in euparal after passage through 95-percent alcohol and eugenol (clove oil). Just as satisfactory were specimens dehydrated in cellosolve and mounted directly in euparal. Euparal was used in preference to balsam because it is easier to handle and dries much more rapidly. To obtain good mounts it is necessary to use enough mounting medium to allow the skins to retain their natural shape and not be flattened. Flattened specimens are difficult to interpret because of the distortion and crowding of hairs. In mounting larval skins of *Tripteroides* it is necessary to stretch them by inserting a needle at the base of the siphon and pulling this part away from the terminal segments in which it is usually telescoped. Pupal skins must be dissected to obtain a good view of all hairs. The abdomen, together with the metanotum, is easily separated from the cephalothorax with a needle passed from side to side. The cephalothorax is opened dorsally and mounted flat in one piece with the ventral surface in the center and dorsal halves laterally. The abdomen with the metanotum attached is mounted with the dorsal surface uppermost.

The male genitalia were prepared and stained according to Komp's method (1942). Then they were dehydrated and dissected in cellosolve and mounted in euparal.

DESCRIPTIONS AND TERMINOLOGY

In the course of this work it was found that many species are practically unrecognizable from the original descriptions, and so, since this genus is still very poorly known, the descriptions are drawn up as completely as possible to facilitate comparison with any new species that may be discovered in the future. Wherever individual rearings were available, the holotype and allotype have associated larval and pupal skins. The descriptions are based not only on the holotype but also on the study of the entire type series. Under the section on "Variation" any marked differences in topotypic material are first noted and then those found in material from other islands.

In the adults the terminology used by Edwards (1941) is used throughout. For the male genitalia I prefer to follow Matheson (1944). For the larva different terminologies are used: For the dorsal head hairs the system devised by Edwards and Given (1928) is adopted, for the ventral head hairs the system used by Marshall (1938), for the terminal abdominal segments the system of Barraud (1934) is followed. For the pupa I prefer to follow the older systems as modified by Edwards (1941) rather than the standardized terminology recently proposed by Rozeboom and Knight (1946) for anophelines and used by Knight and Rozeboom (1945) previously for culicines, since the older system is simpler to use.

TAXONOMIC CHARACTERS

In addition to the various characters used by previous workers in this genus, a number of new ones were found to be useful in the present study. In the adults the presence and number of hairs on the terminal segment of the palpus of both males and females are used to separate three species of *Rachisoura*. The number of propleural bristles may prove to be of generic value, as in the forms from the Solomons all *Tripteroides* s. s. examined had only one propleural bristle, while members of *Rachisoura* and *Mimeteomyia* invariably had a group of 6 to 10 hairs. The relative length of the two apical segments of the male antenna may be of value also. The male genitalia appear to offer characters for the separation of *Tripteroides* s. s. from the others. Only in this subgenus are hairs absent from the basal portion of the sidepiece on the dorsal surface and the basal lobe is farther removed from the base and is more prominent. In the larvae the ventral head hairs may prove to be of considerable value, particularly the position of the submental hair. Brug (1934) figured ventral surfaces of the heads of all larvae described by him but did not use any of the char-

acters to separate species. The pupae of this genus have never been described or figured in detail. I have found the single cephalothoracic hair 1 of *Rachisoura* a good character to separate this subgenus from *Mimeteomyia* and *Tripteroides*, which have this hair 2- or 3-branched. The development of hairs 2 and 3 on the cephalothorax may also be of considerable value. On the abdomen the development of hairs B on the various segments will undoubtedly show good differential characters and may even be of subgeneric value. The position of hair C′ has been useful in separating related species and has also indicated group relationship. The development of hair 2 on segment II also shows distinct possibilities.

GENERAL CONSIDERATIONS

THE GENUS TRIPTEROIDES GILES

The genus *Tripteroides* has been well characterized by Edwards (1932) and also by Lee (1946). There is nothing to add at the present to their diagnosis of the larvae and adults. For the purpose of recognition of *Tripteroides* in the Solomons, a brief summary of the distinctive features is given here. The characters of the pupae are also listed.

Adults.—Vein 6 reaching beyond base of fork of vein 5; squama partially fringed. Pronotal lobes well developed, separate, larger than meron; meron in line with the base of the hind coxa. Pleural bristles reduced: spiraculars present; posterior pronotal usually one (three or four in *Maorigoeldia*) or absent; postspiraculars and lower mesepimerals absent; upper sternopleurals absent or at most weakly developed; postnotals sometimes represented by a few short hairs; propleurals one or more; other pleural bristles present but poorly developed. Pulvilli absent. Antennae of male usually conspicuously plumose, the last two segments elongate. Proboscis not swollen at the tip, usually long and slender. Palpi of male short to almost as long as the proboscis. Head with flat scales only, except for occipital erect scales. Abdomen with very few hairs. Male genitalia with simple mesosome; tenth sternite with one or more teeth at the apex; ninth tergite usually emarginate, with bristly lobes; sidepiece with a poorly developed bristly basal lobe; clasper long, simple, with short apical spine.

Larvae.—Ventral brush reduced to a pair of tufts or even a single pair of hairs; saddle of anal segment incomplete. Siphon without acus; with numerous dorsal, or dorsal and dorsolateral, hairs or spikes; numerous ventral tufts distributed from base to apex; pecten always present, of variable extent. Comb scales in a single row (except in *Maorigoeldia*), arising independently or from a sclerotized plate. Antennae very short, smooth. Mouthparts unmodified except in

Rachisoura, in which maxillae are enlarged and spined. Thorax often with spines. Abdomen and thorax with stellate hairs usually well developed.

Pupae.—Cephalothorax elongate; hair 1 very long, simple or with a few branches. Trumpets of variable length, inner wall well separated from outer, at least basally; uniformly reticulate. Abdominal segments VII and VIII with hair A a large fan-shaped tuft with barbed branches; hair B simple and very long on segments IV to VI or IV to VII; hairs C poorly developed. Paddles small, produced on apex or rounded; without terminal hair or conspicuous fringe, but sometimes with very short hairs on posterior border.

Tripteroides is a member of the Old World sabethines, which include also *Topomyia* and *Harpagomyia*. The latter are readily separated from it because of the absence of a squamal fringe and because of the simple antennae in the male. The striking similarity of *Tripteroides* and *Trichoprosopon*, a member of the New World sabethines, has been noted by Edwards (1929), Lane and Cerquiera (1942), and Lee (1946). The similarity is especially noticeable in the male genitalia and the development of maxillary spines in the larvae of some of the members of both genera. *Tripteroides* is usually readily separated by the absence or very poor development of postnotal bristles, which are always well developed in *Trichoprosopon*. The larvae of the two genera are constantly distinct in that *Tripteroides* always has a pecten and *Trichoprosopon* never. In the majority of other characters the two genera show striking parallelism. Lee (1946) has pointed out that there would be little gained by the union of these two genera, since the primary separation would be on geographical rather than morphological grounds. There is little doubt that these two genera represent the primitive sabethine stock. It is interesting to note that, in the Old World, speciation has occurred principally in the primitive stock without the formation of very distinct genera, while in the New World the primitive stock has given rise to several such specialized genera as *Wyeomyia*, *Phoniomyia*, and *Sabethes*, in which speciation has reached its peak.

At the present time it is best to regard the large assemblage of species in *Tripteroides* as one genus. With further work on this group, generic characters may become more obvious and *Maorigoeldia*, *Rachisoura*, and *Mimeteomyia* may be separated from *Tripteroides* s. s. Edwards (1932) divided *Tripteroides* into four subgenera: *Maorigoeldia* Edwards, *Tripteroides* Giles, *Rachisoura* Theobald, and *Mimeteomyia* Theobald. Lee (1946) modified the definitions and rearranged the species into more natural groupings using the same names, but he was not able to place two species in any subgenus as defined by him. Lee's groupings are on the whole satisfactory for the species of the

Solomon Islands. *Maorigoeldia* does not concern us, as it is represented by a single species endemic in New Zealand, but all the other subgenera are represented in the Solomons.

Rachisoura is considered by Lee to be a valid subgenus principally on the basis of modified spined maxillae in the larvae. This character is not entirely satisfactory and is discussed below under *Mimeteomyia*. The only adult character correlated with this appears to be the presence of only broad outstanding scales on the dorsal surface of veins 1 and 2 and its branches. Two groups are recognized by Lee. The *filipes*-group has outstanding wing scales broad on the dorsal surface of all veins and a single posterior pronotal bristle always present. All the *Rachisoura* known in the Solomons fall into this group. The *vanleeuweni*-group is characterized by broad scales only on veins 1 and 2 and no posterior pronotal bristles.

The subgenus *Mimeteomyia* has been considerably modified by Lee (1946), who characterizes it as follows: Outstanding wing scales all long and narrow, male palpi usually almost as long as the proboscis but sometimes reduced, dull-colored species without silvery or azure markings; larval maxillae unmodified, thoracic spines present in some species. Three groups are recognized: (1) *atripes*-group, in which the male palpi are long and the proboscis is not longer than the abdomen, in the larvae both mesothorax and metathorax with spines and a lateral sclerotized plate on the eighth abdominal segment; (2) *caledonica*-group, in which the male palpi are long but the proboscis is very slender and longer than the abdomen; (3) *obscura*-group, with short male palpi and short stout proboscis. *Tripteroides solomonis* is a typical member of the *atripes*-group, but *T. coheni*, which fits well with the adult characters of *argenteiventris* of the *caledonica*-group, exhibits larval characters intermediate between the subgenera *Rachisoura* and *Mimeteomyia*. The maxillae have apical spines almost half as long as the body of the maxilla. Other characters suggestive of *Rachisoura* are also noted in this species. It would seem then that *Rachisoura* should be based on adult characters rather than larval. The two subgenera may have to be modified in the future, but they serve a useful purpose at the present time.

The subgenus *Tripteroides* includes all the species with very short palpi in both sexes and a very long, slender proboscis that is usually longer than the abdomen. The majority of the species are ornamented with azure-blue on the head and silvery markings on the thorax and abdomen. The larvae have unmodified maxillae and may have spines on the metathorax and also the mesothorax. Two groups are recognized: (1) *aranoides*-group, without dorsocentral bristles, without spotting on the femora and the light scaling of the abdomen and thorax not silver, the scutal scales broad; (2) *nitidoventer*-group with dorso-

central bristles, femora usually spotted, scutal scales largely narrow, and the abdomen and pleura usually with silvery scales. The Solomon species clearly belong to the *nitidoventer*-group.

DISTRIBUTION AND AFFINITIES OF THE SOLOMON SPECIES

The genus *Tripteroides* includes at present 72 species distributed from India to Fiji and from Japan to Tasmania and New Zealand, as shown in table 1. It appears that New Guinea is the center of distribution of this genus, and this will probably remain true even when Borneo and adjacent areas, where *Nepenthes* reaches its peak, are better studied. The subgenus *Tripteroides* is widely distributed with the *nitidoventer*-group occurring throughout the range of the genus except for outlying areas (New Zealand, the New Hebrides, New Caledonia, and temperate Australia). The group *aranoides*, on the other hand, covers only the western end of the range. It is absent north of the Philippines and east of Wallace's Line. The other three subgenera are restricted to the Australasian area (table 2). *Maorigoeldia* is endemic in New Zealand and is known from one species only. *Rachisoura* is found only in the Papuan Region and does not even extend into tropical Australia but is represented in the Solomon Islands by the *filipes*-group. The *vanleeuweni*-group does not occur outside of New Guinea. *Mimeteomyia* has the widest known distribution in Australasia, as it is represented from temperate Australia to Fiji, being absent only in New Zealand.

TABLE 1.—*World distribution and endemicity of* Tripteroides

Subgenus and group	Total number of species	India	Malay, Borneo, East Indies	Philippines	Japan	Papuan	Australian	Polynesian
Maorigoeldia	1	0	0	0	0	0	0	[1] 1(1)
Rachisoura	17	0	0	0	0	17(17)	0	0
filipes	10	0	0	0	0	10(10)	0	0
vanleeuweni	7	0	0	0	0	7(7)	0	0
Mimeteomyia	14	0	0	0	0	11(10)	2(1)	2(2)
atripes	4	0	0	0	0	4(3)	1(0)	0
caledonica	8	0	0	0	0	5(5)	1(1)	2(2)
obscura	2	0	0	0	0	2(2)	0	0
Tripteroides	37	7(5)	11(9)	8(8)	1(1)	12(11)	0	1(1)
aranoides	9	5(4)	2(1)	3(3)	0	0	0	0
nitidoventer	28	2(1)	9(8)	5(5)	1(1)	12(11)	0	1(1)
Subgenus ?	3	0	0	0	0	3(3)	0	0
Total number of species	72	7(5)	11(9)	8(8)	1(1)	43(41)	2(1)	4(4)

[1] Numbers in parentheses indicate endemic species.

In the Solomons nine species are known at the present time. Table 3 shows the distribution in the islands that have been studied. Not more than five species are known to occur on any one island. *T. solomonis* is probably the most widely distributed as well as the commonest species throughout the Solomons. *T. mathesoni* has been found on all the islands where a search for it has been made, and *T. coheni* is reported also from the northern, central, and eastern Solomons. *T. distigma* and *T. floridensis* are known only from single collections in the Florida group. The remaining species show an interesting distribution. *T. torokinae* and *T. binotata* occur only in the northern Solomons, while *T. stonei* and *T. lipovskyi* are apparently restricted to the central and eastern islands.

TABLE 2.—*Distribution and endemicity of* Tripteroides *in Australasia*

Subgenus and group	Number of species east of Wallace's Line	Temperate Australia	Tropical Australia	New Guinea	Solomons	New Hebrides	New Caledonia	Fiji	New Zealand
Maorigoeldia	[1] 1(1)	0	0	0	0	0	0	0	1(1)
Rachisoura	17(17)	0	0	14(14)	3(3)	0	0	0	0
filipes	10(10)	0	0	7(7)	3(3)	0	0	0	0
vanleeuweni	7(7)	0	0	7(7)	0	0	0	0	0
Mimeteomyia	14(14)	2(1)	4(3)	5(5)	2(2)	1(0)	1(0)	1(1)	0
atripes	3(3)	1(0)	2(1)	0	1(1)	0	0	0	0
digoelensis	1(1)	0	0	1(1)	0	0	0	0	0
caledonica	8(8)	1(1)	1(1)	3(3)	1(1)	1(0)	1(0)	1(1)	0
obscura	2(2)	0	1(1)	1(1)	0	0	0	0	0
Tripteroides:									
nitidorenter	13(12)	0	3(2)	[2] 7(5)	3(3)	0	0	1(1)	0
Subgenus ?	0	0	0	2(2)	1(1)	0	0	0	0
Total number of species	48(47)	2(1)	7(5)	[2] 28(26)	9(9)	1(0)	1(0)	2(2)	1(1)

[1] Numbers in parentheses indicate endemic species.
[2] Includes one species from Nissan.

It is of interest to determine the affinities of the Solomon *Tripteroides* with those found in nearby regions. All the species known from the Solomon Islands are endemic. All but one have their nearest relatives in New Guinea or intermediate areas. *T. solomonis* is the one exception. Its near relatives *atripes* (Skuse) and *punctolateralis* (Theobald) occur in temperate and tropical Australia. This group is not represented at all in New Guinea. When the fauna of New Britain and New Ireland is better known it is likely that closer relationship may be exhibited with forms in these islands than with those of New Guinea, but it is doubtful that any species will be found

TABLE 3.—*Known distribution of* Tripteroides *in the Solomons*

Subgenus and species	Bougainville	Treasury (Sterling)	Western New Georgia	Eastern New Georgia	Russell group	Guadalcanal	Florida group
Rachisoura:							
mathesoni	X		X	X	X	X	
stonei			X	X		X	
torokinae	X	X					
Mimeteomyia:							
solomonis	X	X	X	X	X	X	X
coheni		X		X		X	
Tripteroides:							
lipovskyi			X	X		X	
binotata	X						
distigma							X
Subgenus ?:							
floridensis							X
Number of species	4	3	4	5	2	5	3

to occur in both groups. In the subgenus *Rachisoura*, *T. mathesoni*, *stonei*, and *torokinae* most closely resemble *T. filipes* of New Guinea in general morphology but are amply distinct from it. *T. stonei* and *torokinae* are apparently allopatric. They do not occur together, and the degree of morphological differentiation is such that it is better not to consider them as geographical subspecies. *T. stonei* shows considerable geographical variation but not enough to warrant the erection of subspecies on the basis of our present material. In the subgenus *Mimeteomyia*, *T. coheni* appears to be related to *argenteiventris* (Theobald) and *brugi* (Edwards) of New Guinea, but it is very distinct in the larval stage. *T. solomonis*, as has been pointed out above, has its nearest relatives in Australia and shows no relationship to any species in New Guinea. The *Tripteroides* s. s. show strong similarity to New Guinea forms, especially to *bimaculipes* and *quasiornata*, and also to *nissanensis* Lee from Green Island (Nissan). *T. binotata* and *distigma* (Edwards) exhibit a character unknown elsewhere in the *nitidoventer*-group: a patch of broad scales in front of the wing root. *T. distigma* shows distant similarity with *purpurata* of the Fiji Island in the possession of green scutal scales.

It is remarkable that there is hardly anything in common, except the aforementioned distant similarity between *distigma* (Edwards) and *purpurata* (Edwards), between the *Tripteroides* of the Papuan area (New Guinea and the Solomon Islands) and the few species present in the islands east of the Solomons. The other two species that occur in this area (outside of *Maorigoeldia* of New Zealand), namely *caledonica* (Edwards) and *rotumana* (Edwards), have their nearest relatives in Tasmania and southern Australia.

It appears then, on the basis of our present knowledge, that in the

genus *Tripteroides* the Papuan element of New Guinea predominates in the Solomon Islands but has not played a prominent part in the population of the islands east of the Solomons. On the other hand, the temperate Australian element has supplied more of the forms now known to occur in these islands and has even extended into the Solomon Islands.

BIOLOGY

All the species of *Tripteroides* whose immature stages are known have been found breeding in small water collections in tree holes, bamboo, coconut shells, leaf-axils and flower bracts of plants, and especially in the pitchers of *Nepenthes*. A few species occur also in artificial containers, and one has been found on one occasion in a rock hole. The association of *Tripteroides* with the carnivorous *Nepenthes* has been discussed by Lloyd (1942) from a physiological standpoint. It has been noted by several students of *Tripteroides* (Edwards, Brug, Lee) that frequently members of this genus are the only mosquitoes present in the pitchers of *Nepenthes* and that a great number of species probably await discovery when the interior areas of Borneo and New Guinea are studied, as the genus *Tripteroides* reaches its peak of speciation in this ecological niche.

In the Solomons numerous collections have been made in a wide variety of breeding places, and *Tripteroides* has been found to conform very well with previously reported habitats except for the lack of collections in *Nepenthes*. Apparently this pitcherplant is absent from coastal areas. No specific records of *Nepenthes* from the Solomons were found in botanical literature. It is probable that several species of *Nepenthes* will be found when searched for in the proper places in the Solomons, since this genus is abundantly known in New Guinea and is represented by several species in New Caledonia. J. G. Franclemont informs me that he saw pitchers of *Nepenthes* collected at high elevations on Kolumbangara Island.

Table 4 shows the habitats of the immature stages of *Tripteroides* species in the Solomon Islands and the percentage of collections of each species in the different habitats. It will be noted that out of eight species whose immature stages are known, six breed in tree holes, four of these preferring this habitat to others. *T. solomonis* has been found more frequently in artificial containers than any natural breeding place. Three other species also breed in artificial containers. Bamboo stubble is used by three species also, coconut shells by two. *T. mathesoni* is restricted to the leaf-axils of taro plants (*Alocasia* sp., *Colocasia* sp.), and *T. binotata* occasionally utilizes them. The larval habitat of *floridensis* is particularly unusual in that the leaf-axils of banana plants in the Solomon Islands apparently never hold water but usually contain only a small amount of muck. Several hundred

banana leaf-axils have been examined in this area, but only one has ever produced mosquito larvae. Further collections at the proper time of the year in this and similar plants, and in flower bracts of *Heliconia*, may reveal additional *Tripteroides* in the Solomons. It is well to remember that in such habitats the larvae may not be visible until the muck is diluted with water and that they often cling to the plant.

TABLE 4.—*Habitats of immature stages of* Tripteroides

Species	Frequency of occurrence of each species in—						
	Leaf-axils of taro (*Alocasia, Calocasia*)	Leaf-axils of banana	Leaf-axils of sago	Tree holes	Coconut shells	Bamboo stubble	Artificial containers
mathesoni	100						
stonei				10	45	20	25
torokinae				100			
solomonis				35		5	60
coheni				100			
lipovskyi			5	60	15	5	15
binotata	15			70			15
floridensis		100					

The larval habits are very similar in all *Tripteroides* of the Solomons. The larvae normally rest and move on their backs on the bottom of their breeding places, where they feed. They seldom come to the surface. In the subgenus *Rachisoura* the larvae are predaceous, feeding on other mosquito larvae and also on members of their own species. To what degree they are predaceous in nature has not been determined, but in the laboratory they can be reared to adulthood on artificial media. In the field we have noted that species of *Rachisoura* feed on dead ants stranded in their breeding places. The larval development is rather long and may take two weeks or longer, even under natural conditions, except perhaps for *T. solomonis*.

The pupae of *Tripteroides* are easily recognized in the field by the large fan-shaped tufts on segments VII and VIII of the abdomen. They are unusually large in the subgenus *Rachisoura*. Development is slow. It usually takes three to four days or even longer in the laboratory.

During the course of this study, eggs of *Tripteroides* were not collected. Edwards (1932) states that they are laid singly on the surface of the water of breeding places.

The habits of the adults are poorly known. The majority of species do not attack man, but a few become pests. In the Solomons, *T. solomonis* frequently bites humans, readily enters dwellings, and is attracted to electric lights. Of the other species, *lipovskyi* and *stonei* occasionally bite man. The remainder probably obtain their blood

meals from birds, bats, or reptiles. As with the New World sabethines, the majority of species of *Tripteroides* are shy, retiring jungle inhabitants. They have been observed resting near their breeding places in plants and on the buttresses of large trees.

KEYS TO ADULTS, MALE GENITALIA, PUPAE, AND LARVAE OF TRIPTEROIDES

1. ADULTS

(Adults of *floridensis* are unknown)

1. Anterior portion of head largely azure-blue; at least middle femora with silvery markings on anterior surface; silvery pleural scaling restricted to pronotal lobes, posterior pronotum, sternopleuron, and mesopleuron 2
   Anterior portion of head almost completely dark; femora without silvery markings on anterior surface; pleura almost completely covered with white or whitish scales 4
2. Abdomen without silvery markings; midfemora with a pale spot in middle anteriorly; mesonotal scales mainly greenish ..... distigma (Edwards)
   Abdomen with conspicuous silvery markings; all femora with silvery spots or lines anteriorly; mesonotal scales dark 3
3. Supraalar area with a patch of broad, dark scales; head with dark longitudinal stripe in center; scutal integument dark, at least posteriorly. ..... binotata, new species
   Only narrow scales present on scutum; anterior two-thirds of head uniformly azure-blue dorsally; scutal integument usually very light orange. ..... lipovskyi, new species
4. Wing scales narrow on upper surface; male palpi almost as long as proboscis 5
   Wing scales all broad on upper surface; male palpi less than half as long as proboscis 6
5. Abdomen with conspicuous lateral white spots; proboscis stout; no dorsocentral bristles (prescutellars present) ..... solomonis (Edwards)
   Abdomen without conspicuous lateral white spots; proboscis very slender; 1 pair of anterior dorsocentral bristles present ..... coheni, new species
6. Males; terminal antennal segments greatly elongated, genitalia prominent 7
   Females; terminal antennal segments only slightly longer than preceding segments; genitalia not apparent 9
7. Palpus without terminal bristles ..... mathesoni, new species
   Palpus with long, conspicuous terminal bristles (fig. 33, *a*, *b*) 8
8. Palpus with 4 to 8 long bristles on apex (fig. 33, *b*); prescutellars at least 2 pairs of strong bristles ..... stonei, new species
   Palpus with 20 or more long bristles on apex (fig. 33, *a*); prescutellars at most 1 pair of weak bristles ..... torokinae, new species
9. Palpus with at least 3 terminal hairs, stout and not arising side by side; prescutellars at most 1 pair of weak bristles ..... torokinae, new species
   Palpus with at most 2 long, slender hairs arising side by side on terminal segment; prescutellars at least 2 pairs of strong bristles 10
10. Only lower third of posterior pronotum light-scaled; palpus without terminal hairs; breeding in taro leaf-axils only ..... mathesoni, new species
    At least lower half of posterior pronotum light-scaled; palpus either without terminal hairs, with 1 or, at most, 2 long, very slender hairs, arising side by side on apex; breeding in coconut shells, bamboo, tree holes, etc., never in taro leaf-axils ..... stonei, new species

2. MALE GENITALIA

(Males of *distigma* and *floridensis* are unknown)

1. Basal half of sidepiece without hairs on dorsal surface; basal lobe well developed (figs. 33, *h, j;* 34, *a*) ..... lipovskyi, new species
   binotata, new species
   Basal half of sidepiece with numerous hairs; basal lobe poorly developed (fig. 34, *b–d*) 2
2. Apex of tenth sternite with a large single spine (fig. 34, *c*); mesosome very slender (fig. 34, *f*) 3
   Apex of tenth sternite with 3 or more teeth (fig. 33, *i*); mesosome broad (fig. 34, *b, d*) 5
3. Interlobar space on ninth tergite much narrower than lobes (fig. 33, *c, e*) 4
   Interlobar space on ninth tergite broad, as wide as lateral labes (fig. 33, *d*).
   mathesoni, new species
4. Bristles on lobes of ninth tergite flattened and broad (fig. 33, *c*).
   torokinae, new species
   Bristles on lobes of ninth tergite not flattened, relatively slender (figs. 33, *e;* 34, *c, f*) ..... stonei, new species
5. Ninth tergite lobes with 3 to 6 large bristles arising in a single row (figs. 33, *f, i;* 34, *b*) ..... solomonis (Edwards)
   Ninth tergite lobes with 8 to 10 bristles arising in an irregular double row figs. 33, *g;* 34, *d*) ..... coheni, new species

3. PUPAE

(Pupae of *torokinae, binotata, distigma,* and *floridensis* are unknown)

1. Hair B of segment VII very long, extending well beyond apical margin of segment VIII, usually beyond apex of paddles (fig. 37, *c, b*).
   lipovskyi, new species
   Hair B of segment VII at most extending to about middle of segment VIII, usually much shorter (fig. 37, *c–f*) 2
2. Hair 2 of segment II most conspicuous hair on that segment, usually about twice as long as B; hair 1 of cephalothorax double or triple (fig. 37, *c, e*) 3
   Hair 2 of segment II smaller or equal to B, which is the most conspicuous hair on that segment; hair of 1 of cephalothorax simple, not branched (fig. 37, *d, f*) 4
3. Hair C′ laterad or at level of C on segments IV to VI; hair 2 of segment II arising caudad of A or at same level, i. e., in apical fourth; large abdominal hairs without unpigmented areas at their base (fig. 37, *e*).
   coheni, new species
   Hair C′ well mesad of C on segments IV to VI; hair 2 of segment II arising distinctly cephalad of A, i. e., in about middle of segment; large abdominal hairs with unpigmented areas at their base (fig. 37, *c*) ..... solomonis (Edwards)
4. Hair C′ mesad of C on segments IV to VI; paddles produced into short truncate lobes at apex, without hairs on lobes (fig. 37, *f*) ..... mathesoni, new species
   Hair C′ laterad of C on segments IV to VI; paddles usually not produced into lobes, rounded at apex, with short submarginal hairs on apex (fig. 37, *d*).
   stonei, new species

4. LARVAE (FOURTH INSTAR)

(Larvae of *distigma* are unknown)

1. Thoracic spines present (fig. 34, *e*) 4
   Thoracic spines absent 2

2. Ventral hair of anal segment single, arising from saddle (fig. 36, *a*) ; pecten teeth conspicuously fringed; middle segments of abdomen with 2 pairs of well-developed dorsal stellate tufts; maxillae with short terminal spines (fig. 36, *b*) ---------- coheni, new species

   Ventral hair of anal segment a multiple tuft arising from the membranous part of segment (fig. 35, *c*, *f*) ; pecten teeth simple; middle segments of abdomen with only 1 pair of poorly developed dorsal stellate tufts (fig. 35, *b*, *e*) ; maxillae with long terminal spines (fig. 35, *a*, *d*) ---------- 3

3. Dorsal abdominal hairs on segments III to V consisting of a stellate tuft and a minute hair anteriorly (fig. 35, *b*) ; pecten teeth at least 6 in number on each side (fig. 35, *c*) ; breeding in taro leaf-axils only (fig. 35, *a*).
   mathesoni, new species

   Dorsal abdominal hairs on segments III to V consisting of a stellate tuft and a single long spike arising from the same or a separate tubercle (fig. 35, *e*) ; pecten teeth at most 5 on each side (fig. 35, *f*) ; breeding in coconut shells, etc. (fig. 35, *d*) ---------- stonei, new species
   torokinae, new species

4. Eighth abdominal segment with a sclerotized plate from which comb scales arise (fig. 34, *h*) ---------- 5

   Eighth abdominal segment without a sclerotized plate; comb scales very numerous (fig. 36, *c*, *d*) ---------- lipovskyi, new species
   binotata, new species

5. Both mesothoracic and metathoracic spines present; some of dorsal head hairs branched ; antennal shaft hair arising beyond middle (fig. 36, *c*).
   solomonis (Edwards)

   Only metathoracic spine developed (fig. 34, *e*) ; dorsal head hair single; antennal shaft hair arising in basal half (fig. 34, *g*, *h*) -- floridensis, new species

TRIPTEROIDES (RACHISOURA) MATHESONI, new species

FIGURES 33, *d* ; 35, *a-c* ; 37, *f*

Rachionotomyia (*Rachisoura*) *filipes* PAINE and EDWARDS, 1929, pp. 305, 310–312.
T. (*Rachisoura*) *filipes* EDWARDS, 1932, p. 76.
T. (*R.*) *filipes* LEE, 1944, p. 18.
T. filipes KNIGHT, BOHART, and BOHART, 1944, p. 22.
T. (*R.*) *filipes* sensu Paine and Edwards, LEE, 1946, p. 246.

FIGURES : Male: Lee, 1946, p. 245 (ninth tergite). Larvae: Paine and Edwards, 1929, p. 311 (maxilla, thorax, terminal segments of abdomen; as *T. filipes*) ; Lee, 1944, p. 18 (terminal abdominal segments; as *T. filipes*) ; Lee, 1946, p. 254 (maxilla).

Distinctive characters.—ADULTS: Unornamented, wing scales all broad dorsally. Proboscis 1.2 of front femur. Palpi 0.21–0.23 of proboscis, without bristles at apex in either sex. Two or more pairs of prescutellar bristles present, one posterior pronotal. Ninth tergite of male with wide, shallow emargination. Light scaling on posterior pronotum usually restricted to lower third.

LARVAE: Maxilla with greatly developed terminal spines. No thoracic spines. Stellate tufts poorly developed. Middle abdominal segments dorsally with small stellate tuft and minute hair anteriorly on each side. Pecten teeth at least six on each side. Siphon very

dark, index 3. Comb scales in an irregular single row, 6 to 11 in number.

Description of male.—Wing: 3–4 mm.

Head: Proboscis 1.2 as long as front femur, slightly shorter than abdomen, dark-scaled; labella lighter. Palpi approximately 0.23 of proboscis, dark-scaled; terminal segments simple, without conspicuous hairs. Clypeus dark brown, bare. Antenna 0.80 of proboscis; torus dark brown, with minute light hairs; flagellar whorls scanty; last two segments elongate, with denser pubescence, penultimate equal to three preceding segments, terminal 1.5 as long as penultimate. Vertex clothed with broad, appressed, dark scales except for a narrow light line along eye margins and a pair of lateral white-scaled patches; erect occipital scales short, white in the center, dark laterally.

Thorax: Scutal integument dark brown, thick shaggy vestiture of mixed broad and rather narrow curved, appressed, dark bronzy scales, a few narrow white scales on anterior promontory; dorsocentral and acrostichal bristles absent, prescutellar bristles usually two to four pairs, numerous bristles on anterior promontory and supra-alar areas, all bristles dark brown. Scutellum dark, completely covered with very broad, appressed, flat, dark, bronzy scales; bristles dark brown. Postnotum brown, darker centrally; two to four minute hairs usually present on lower central portion. Pleural integument rather light brown, less heavily sclerotized areas tan; upper part of propleuron, lower anterior part of sternopleuron, middle posterior part of mesopleuron, meron and metameron bare; pronotal lobe light-scaled basally, with mixed dark and light scales on upper part; posterior pronotum usually white-scaled on basal third only, the upper two-thirds dark-scaled; remainder of pleura completely covered with broad, appressed, translucent, white scales. Pleural bristles: anterior pronotals four to six dark bristles above and six to ten lighter, weaker bristles below; one dark posterior pronotal; spiraculars usually two or three dark bristles; propleurals four to six light hairs; lower sternopleurals six to eight light hairs; one to three upper sternopleural hairs occasionally present; prealars three to six dark bristles; upper mesepimerals ten to twelve light hairs. Halteres light and bare on base and lower part of stem, upper part of stem and knob dark-scaled.

Wings: Scales all dark. Outstanding scales broad on all veins dorsally, narrow on lower surface of veins 3 to 6. Bases of fork cells approximately equidistant from wing base. Fringe mostly dark. Squama fringed.

Legs: All dark bronzy except for white-scaled coxae and trochanters and conspicuously light-scaled ventral surfaces of all femora; lower surface of all segments somewhat lighter. Enlarged claw of front tarsus with a tooth near the middle, that of middle tarsus simple.

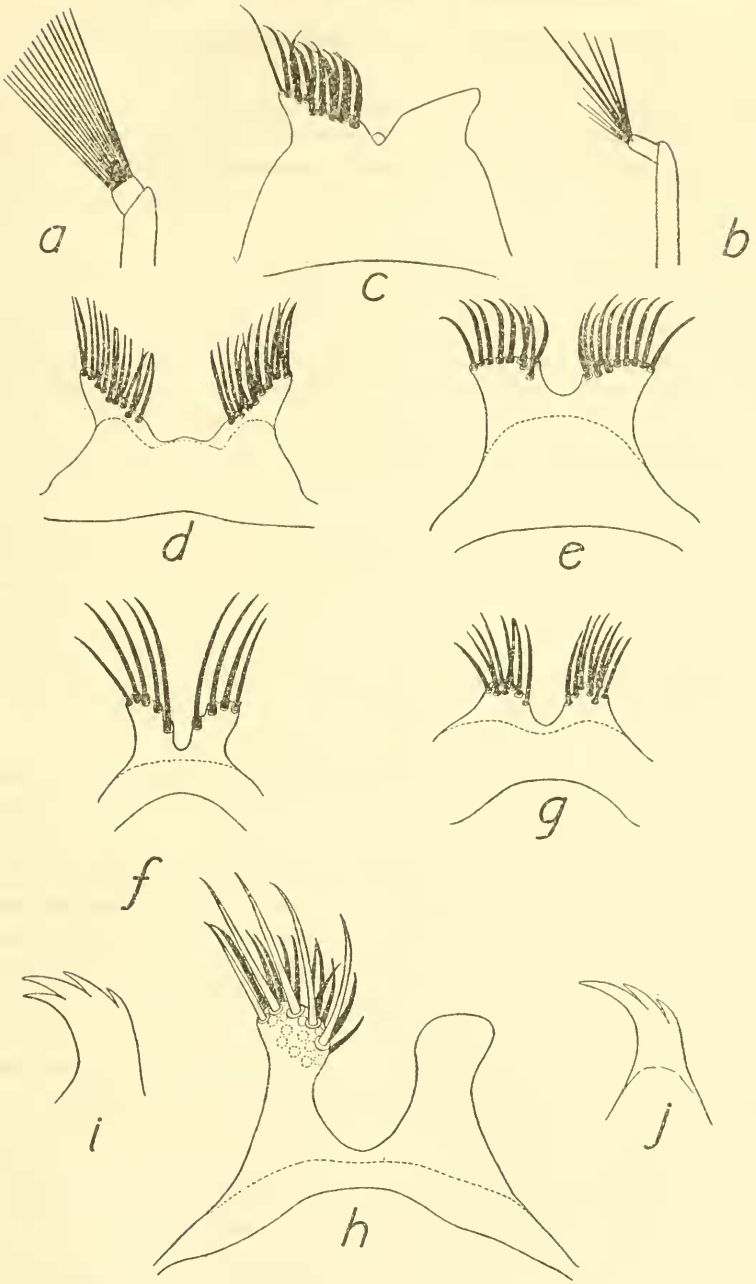

FIGURE 33.—*a*, *Tripteroides torokinae*, new species, apex of male palpus; *b*, *T. stonei*, new species, apex of male palpus; *c*, *T. torokinae*, ninth tergite of male genitalia (bristles shown on left lobe only); *d*, *T. mathesoni*, new species; ninth tergite of male genitalia; *e*, same of *T. stonei*; *f*, same of *T. solomonis* (Edwards); *g*, same of *T. coheni*, new species; *h*, same of *T. lipovskyi*, new species; ninth tergite of male genitalia (bristles shown on left lobe only); *i*, *T. solomonis*, apex of tenth sternite of male genitalia; *j*, *T. lipovskyi*, apex of tenth sternite of male genitalia.

Apex of hind tibia and base of first hind tarsal segment with specialized hairs and scales. Hind tibia 0.9 of middle tibia.

Abdomen: Very dark iridescent bronzy dorsally; lateral portions of tergites light-scaled (invisible from above); ventral surface uniformly white-scaled. First tergite with numerous light hairs, eighth segment with strong dark bristles; bristles on other segments very sparse.

Genitalia (fig. 33, *d*): Sidepiece conical, densely covered with scales laterally and ventrally, dorsal surface with bristles only, bristles present on basal portion; basal lobe poorly developed, with 7 to 10 large bristles and numerous smaller bristles and hairs; clasper long, slender, smooth, with a short terminal spine. Mesosome simple, very slender, composed of two lateral plates, each with an apical ventral spur and two dorsal projections. Tenth sternite with a single, strong tooth; basal arm expanded at base, slender beyond the middle. Ninth tergite (fig. 33, *d*) with a wide, shallow, median emargination approximately equal to width of one of the lateral lobes; lobes extending diagonally caudad from the emargination, with 12 to 14 or more strong bristles along apical margin, arranged in two irregular rows.

Female.—Very similar to the male, except for sexual characters. Terminal antennal segments not elongate. Proboscis 1.1 to 1.2 as long as front femur, slightly shorter than abdomen. Palpi 0.21 to 0.22 of proboscis, terminal segment without long hairs.

Pupa (fig. 37, *f*).—Cephalothorax: Uniformly pigmented a deep yellow; dorsal portion of mesothorax darker, brownish. Trumpet darkly pigmented throughout, uniformly reticulate; index of length to median width about 3.5 to 1; somewhat swollen just before middle and compressed laterally near apex; inner wall conspicuously separated from outer in basal half; opening small, slightly oblique, basal notch very shallow. Hair 1 very long, always simple, darkly pigmented; hairs 2 and 3 small, inconspicuous, usually with two branches; 4 and 5 inconspicuously pigmented, usually double, 5 longer than 4; 6 minute; 7 fairly long, poorly pigmented; 8 and 9 shorter than trumpet, moderately pigmented, 8 normally double, 9 occasionally with two branches; 10 almost as long as 11, but poorly pigmented, simple or double beyond base, 11 about two-thirds of 12, pigmented, double beyond middle; 12 long, pigmented, simple or double beyond middle.

Abdomen: First segment largely yellow; remainder of abdomen a darker yellow, with brownish infuscation on proximal segments. First segment: float hair very poorly developed, a long dendritic hair with few primary branches; hairs H and L very small, simple; U minute; M small, with a few branches; S fairly long, simple, poorly pigmented; T larger, simple, pigmented; K much longer than the others and well pigmented. Hair B (8) on segments IV to VI very long, simple, rather stout and darkly pigmented, usually reaching beyond

apex of following segments on IV and V, somewhat shorter on VI, all inserted near apical margin; on segments II and III, much weaker, very slender, lightly pigmented, not reaching the apex of following segments; poorly developed on VII. Hair C (10) small, inconspicuous, lightly pigmented or not at all, branched on basal segments, usually simple or with a few branches at tip on posterior segments. Hair C′ usually simple, very short, inconspicuous, inserted about a sixth from apex of segments; placed mesad of C, especially noticeably on segments IV to VI. Hair A very small, unpigmented on segments II to VI, inserted on lateral border; on segments VII and VIII a large fan-shaped tuft with barbed branches, inserted well away from posterolateral angle on ventral surface on segment VIII, near posterolateral angle on dorsal surface on segment VII; that of VIII shorter than paddles. Hair 2 of segment II inconspicuous, shorter than B, usually with three or more branches. Paddles clear yellow, rather short, a few minute hairs near apex, particularly on inner border, no apical hairs, midrib poorly developed, evanescent at tip; roughly triangular with apex produced into short truncate lobe at end of midrib; inner half very narrow, about third of width of outer half.

Male genitalia: Genital lobes extending to about nine-fourteenths of paddles, about as long as wide, curved laterally, apex rounded. Anal lobe (segment IX) a little more than half as long as genital lobes, broadly rounded and much narrower than genital lobes.

Female genitalia: Genital lobes a little less than half as long as the paddles; broadly rounded. Anal lobe a little less than five-sixths of genital lobe, three-fourths as wide, broadly rounded.

Larva (fig. 35, *a-c*).—Head (fig. 35, *a*): Slightly longer than wide, uniformly pigmented a light brown. Antenna cylindrical, very short, smooth; shaft hair short, simple, placed at apical third or beyond. Dorsal head hairs very slender and practically invisible: hair A usually double, B simple, C usually double or triple, d long and simple, e simple, f usually double, ocular simple. Ventral head hairs poorly developed: postmaxillary usually lightly pigmented, about half as long as the antenna or shorter; infraorbital usually simple; submental placed far forward. Clypeal spines very slender and lightly pigmented. Maxilla elongate, with two greatly developed, articulated, apical spines; the largest spine about as long as the body of the maxilla and projecting beyond anterior margin of the head; at the base of the smaller spine a number of smaller teeth; a recurved tooth at the base of the larger spine. Labral tuft very slender.

Thorax: Prothorax with a pair of stellate tufts dorsally and another pair laterally, three or four branches in each tuft. Stellate hairs absent from other segments. No spines or thickened hairs. Metathorax with a large dorsolateral, 12- to 18-branched tuft, branches very long and slender, plumose.

Abdomen (fig. 35, *b*, *c*) : Stellate tufts poorly developed, very small, inconspicuous. On first segment two stellate tufts on each side dorsally, arising from a common basal tubercle; on following segments (fig. 35, *b*) the stellate tufts are reduced to a single pair dorsolaterally, with a short simple hair usually present in front of tuft but not arising from a basal tubercle, except occasionally on segments 2 and 3; tufts with four to six barbed branches. Comb composed of 6 to 11 pointed teeth with strong basal denticles. Pentad hairs weakly developed, except for hair 1, which is a stellate tuft of 5 to 12 branches arising from a basal tubercle; hair 3 usually 4-branched; 5 usually double; 2 and 4 usually simple. Siphon very heavily pigmented, usually black; acus absent; index 3 or slightly more; parallel-sided at basal fourth, then attenuated to about third of basal width at apex; pecten of six to nine strong, heavily pigmented, simple teeth (occasionally with minute barbs), pecten usually absent from basal third, but extending to apex; an irregular double row of 10 to 12 dorsal hair tufts, each usually with four barbed branches about as long as basal diameter of siphon; 11 to 16 ventral hair tufts, the basal two are paired and 6- to 8-branched, remainder usually in an irregular single row and 3- to 5-branched, all minutely barbed; a strong, curved, apicodorsal hair; ventral valve with a long 2- to 4-branched hair. Anal segment with a small black, incomplete saddle, posterior margin with four or five small denticles; saddle hair simple, stout, and long; ventral brush reduced to a pair of tufts, each with six to eight very long, barbed branches; dorsal brush very long, hairs barbed, ventral subcaudal tuft simple, dorsal with seven or eight branches; gills longer than saddle hair, attenuated, occasionally dorsal pair shorter than ventral.

Types.—U.S.N.M. No. 59086 (holotype, allotype, and paratypes) : Holotype ♂ (260–12), allotype ♀ (260–14) with larval and pupal skins, bred from larvae collected in taro leaf axils, Matanikau River Valley, Guadalcanal, March 13, 1944 (L. J. Lipovsky, A. W. Barnes).

Paratypes (23 ♂, 33 ♀) all bred from larvae and pupae collected in taro leaf-axils in various river valleys on Guadalcanal, as follows: 1 ♂ (260–13), 2 ♀ (260–11, 15) with larval and pupal skins, 3 ♂, 3 ♀, 1 larva (260), same data as holotype and allotype; 3 ♀ (160), White River, January 19, 1944 (S. Civinski) ; 1 ♀ (254), Matanikau River, March 10, 1944 (JNB) ; 2 ♂, 1 ♀ (336) Lunga River, April 28, 1944 (F. B. Wysocki) ; 1 ♂, 2 larvae (372), La Sage Creek, May 10, 1944 (L. J. Lipovsky) ; 1 ♀ (392–4), Marine Creek, Matanikau, May 19, 1944 (J. J. Cuccio) ; 2 ♂, 2 ♀ (418) La Sage Creek, May 30, 1944 (V. R. Roa, F. B. Wysocki) ; 2 ♀ (541–14, 15) with larval and pupal skins, 1 larval and pupal skin (541–12), Marine Creek, Matanikau, July 31, 1944 (L. J. Lipovsky, M. Cohen) ; 1 ♀ (560), Matanikau, August 4, 1944 (L. J. Lipovsky) ; 1 ♂ (625–12), 3 ♀ (625–11, 13, 14) with larval

and pupal skins, 2 ♂, 3 ♀ (625), Kokumbona River, August 24, 1944 (M. Cohen, H. F. Sexauer); 5 ♂, 6 ♀ (659–1), Bonegi River, September 25, 1944 (F. B. Wysocki, V. R. Roa); 1 ♂ (747–2), Lunga River, November 20, 1944 (M. Cohen); 2 ♂, 1 ♀ (755), Matanikau River, November 21, 1944 (M. Cohen, V. R. Roa); 1 ♀ (764–4) Matanikau River, December 2, 1944 (JNB); 1 ♂, 1 ♀ (784–1), Wright's Creek, Matanikau, December 20, 1944 (M. Cohen, F. B. Wysocki); 1 ♂ (819) La Sage Creek, January 15, 1945 (F. B. Wysocki, J. J. Cuccio, C. S. Hollingshead); 1 ♀ (822–2) Lunga River, January 17, 1945 (JNB); 1 ♂, 1 ♀ (938–1), White River, April 7, 1945 (M. Cohen). Paratypes to be deposited in the collections of Cornell University; British Museum (Natural History); U. S. National Museum; and Council for Scientific and Industrial Research, Canberra, A. C. T., Australia.

This species is named in honor of Prof. Robert Matheson, who has kindly encouraged and directed my interest in mosquitoes.

Taxonomic discussion.—Paine and Edwards (1929) reported this species from the Solomons as *T. filipes* (Walker). Edwards in the same paper described and figured a larva under that name. There is little doubt that these authors were dealing with *mathesoni*, as the larval description agrees very well with the concept of the present species except for minor details. The discrepancies noted may be due to the probable inclusion of *T. stonei* larvae in the material from which the description was made, since Edwards had specimens collected "on one occasion only, in water in leaf-axils of a large wild Aroid and in leaves on the ground in forest at Ilu, Guadalcanar." *T. mathesoni* has been collected only in *Colocasia* and *Alocasia* sp., while *stonei* is a general breeder in small water receptacles. In his monograph of the Australasian *Tripteroides,* Lee (1946) has applied Walker's name to a species of similar appearance occurring commonly in New Guinea and in North Australia. *T. mathesoni* is distinguished from *filipes* as defined by Lee (1946) by the relatively longer hind tibiae in the adults (0.9 of middle tibiae in *mathesoni* and 0.75–0.78 in *filipes*), by the shallow, wide emargination and the broad lobes of the ninth tergite in the male (emargination is deep and narrow, the lobes are longer than wide in *filipes*), and the shorter maxillary spine in the larva (longer than the body of the maxilla in *filipes*). Larval habitats differ also, *mathesoni* breeding in the leaf-axils of *Colocasia* and *Alocasia* sp. and *filipes* in *Nepenthes* pitchers.

T. mathesoni closely resembles all the other members of the *filipes*-group of the subgenus *Rachisoura.* This group is characterized by the following features: Unornamented femora, only broad wing scales on the dorsal surface of all veins, and a single posterior pronotal bristle in the adults, and an enlarged, elongate maxilla with long terminal spines in the larva. Lee (1946) recognizes seven species in

this group: *confusa* Lee, *filipes* (Walker), *fuliginosa* Lee, *fuscipleura* Lee, *latisquama* (Edwards), *longipalpata* Lee, *papua* Brug. In addition to *mathesoni*, two other Solomon species fall into this group, namely, *stonei* and *torokinae*. These three species cannot be confused with *longipalpata* and *confusa*, since the latter have palpi at least two-thirds as long as the proboscis in the male. *T. latisquama* differs from the Solomon species in the larger number of prescutellar bristles, usually six or seven pairs: *fuscipleura* is separated by the extremely short male palpi (less than one-sixth the length of the proboscis) and the proboscis longer than the front femur; *fuliginosa* has all the erect occipital scales dark (they are white in the center in *mathesoni*, *stonei*, and *torokinae*); *T. filipes*, as has already been mentioned above, has short hind tibiae. *T. papua* closely resembles *mathesoni* and the other Solomon *Rachisoura*, but, according to Brug's description, can be separated on the basis of the short proboscis of the female, 0.75 of abdomen and 0.9 of front femur, and the longer palpi of the male, about 0.3 of proboscis.

The larval stage has been described for only four species of this group outside of the Solomons. The obvious differences noted are as follows: *longipalpata* has the apical spine of the maxilla over twice the length of the body of the maxilla; *fuscipleura* is easily separated by the pecten restricted to the basal portion of the siphon; *confusa* has a simple ventral siphonal valve hair; *filipes* can be separated from *mathesoni* by the smaller number of comb scales (3 to 5, as compared with 6 to 11).

T. mathesoni males cannot be confused with those of *stonei* and *torokinae* since the apex of the palpus has no specialized bristles and the ninth tergite is very characteristic. The females, on the other hand, cannot be separated always from those of *stonei* as both usually lack bristles on the apex of the palpus and the amount of white scaling on the posterior pronotum is often difficult to determine exactly. The larvae of *mathesoni* differ from those of *stonei* and *torokinae*, particularly in the greater development of the pecten teeth, the longer siphon, and the reduction of the dorsal hairs on the abdominal segments.

No other species of *Rachisoura* is known to breed in the leaf-axils of species of *Colocasia* and *Alocasia*. Apparently *mathesoni* is restricted to this ecological niche, as numerous collections throughout its known range have failed to reveal it in any other habitat.

Variation.—A study of 12 individual rearings from Guadalcanal shows considerable variation in individuals of this species. In the adults the postnotal bristles are often absent, the spiracular bristles vary from two to four, and the upper sternopleurals are just as frequently absent as present, when present being very poorly developed.

The prescutellars usually are represented by two pairs of strong bristles but may be increased to four pairs. The white scaling of the posterior pronotum is usually restricted to the lower third of this sclerite, but in large, vigorous specimens it may extend to almost half the sclerite. One female examined had well-developed scales on the anterior margin of the clypeus. In the larvae, the most obvious variation is noted in the development of the maxillary spines and the stellate tufts, particularly on the abdomen. Some specimens show stellate hairs that are almost twice the length of those in others. The pigmentation of the stellate tufts varies considerably, as well as the number of branches. The number of comb scales is not constant even on the two sides of an individual. They vary anywhere from 6 to 11 on each side. All these characters were found to overlap similar characters in *stonei*.

On the other hand, the following characters showed no overlapping with other species: In the adults, simple male palpi, shape of the ninth tergite of the male; in the larvae, development of dorsal hairs on the middle abdominal segments, number of pecten teeth, pigmentation and length of siphon, absence of spike hairs from the metathorax, and the small size of the postmaxillary hair on the head. Whereas in *mathesoni* all the structures associated with the siphon are strongly developed and the head, thoracic, and abdominal hairs are reduced, in *stonei* and *torokinae* the reverse is true.

T. mathesoni shows no geographical variation that has not been noted in individuals from Guadalcanal. Specimens examined from eastern and western New Georgia, Roviana, and Bougainville conform very well with the type material.

Specimens examined: 12 individual rearings, 148 adults, 156 larvae, 57 pupae.

Biology.—T. mathesoni larvae have been collected only in the leaf-axils of wild species of taro (*Colocasia* and *Alocasia* sp.) throughout the year. Usually only a few full-grown larvae are present in a leaf-axil. The larvae are predaceous and cannibalistic. They normally rest on their backs at the bottom of their breeding places with the enlarged, spined maxillae projecting forward and upward from the head. In the laboratory they have been observed to catch and slowly consume the larvae of *Uranotaenia quadrimaculata* Edwards as well as individuals of their own species. When denied other larvae for food, nearly mature individuals will, nevertheless, complete their development, pupate and emerge as adults, although in such cases the aquatic cycle is greatly prolonged. The larval stage, under laboratory conditions and with adequate food, is approximately three weeks. The pupae, which are extremely large compared with the size of the adults, take several days for development.

In the field the larvae are easily recognized by their large size, elon-

gated bodies, and white coloration, which contrasts strongly with the small dark brown stellate tufts on the abdominal segments. The enlarged maxillae are very prominent in living specimens.

The adults are seldom seen in the field except around taro plants, where they apparently rest during the day. On several occasions females of this species have been noticed flitting around collectors in the jungle but have not been recorded as biting humans. They have not been collected in light traps or in lighted human quarters at night. In the laboratory, adults could not be induced to feed on humans.

Only *U. quadrimaculata* Edwards has been found in association with this species and then only with the younger instars of *mathesoni*. Large specimens of *mathesoni* are usually found singly or at most three to four per leaf-axil.

Distribution.—Solomon Islands: *Guadalcanal:* Generally distributed on north-central and northwest coast (JNB et al., K. L. Knight, P. W. Oman, D. E. Beck et al., A. B. Gurney, J. G. Franclemont) [U. S. N. M., CU, JNB], Ilu (Paine and Edwards, 1929) as *T. filipes* Walker. *New Georgia:* Segi Point (C. O. Berg) [U. S. N. M.], Munda Point (J. G. Franclemont) [U. S. N. M., CU, JNB], Roviana (J. G. Franclemont) [CU, JNB], (Paine and Edwards, 1929) as *T. filipes* Walker. *Bougainville:* Empress Augusta Bay (A. B. Gurney) [U. S. N. M.].

TRIPTEROIDES (RACHISOURA) STONEI, new species

Figures 33, *b*, *c*; 34, *c*, *f*; 35, *d-f*; 37, *d*

Distinctive characters.—Adults: Unornamented, wing scales all broad dorsally. Proboscis 1.2 of front femur. Palpi of male 0.27 of proboscis, with 4 to 8 long bristles on apex. Palpi of female 0.21 to 0.23 of proboscis, either without bristles or with a pair of slender apical bristles arising side by side. Ninth tergite of male with a deep, narrow emargination; bristles on lobes relatively slender. Light scaling on posterior pronotum often completely covering sclerite.

Larvae: Maxilla with greatly developed terminal spines. Thoracic spines absent. Middle abdominal segments dorsally on each side with a stellate tuft and a single spike anteriorly, arising from the same or a separate tubercle. Pecten teeth at most five on each side. Siphon light brown, index 2.5 or less. Comb scales in an irregular single row, four to eight in number.

Description of male.—Wing: 3-4 mm.

Head: Proboscis 1.2 as long as front femur, slightly shorter than abdomen, dark-scaled; labella lighter. Palpi (fig. 33, *b*), exclusive of terminal segment, 0.27 of proboscis, dark-scaled; apical segment very short, bent internally, with specialized bristles as shown in figure, usually four to six large bristles and several shorter, weaker hairs.

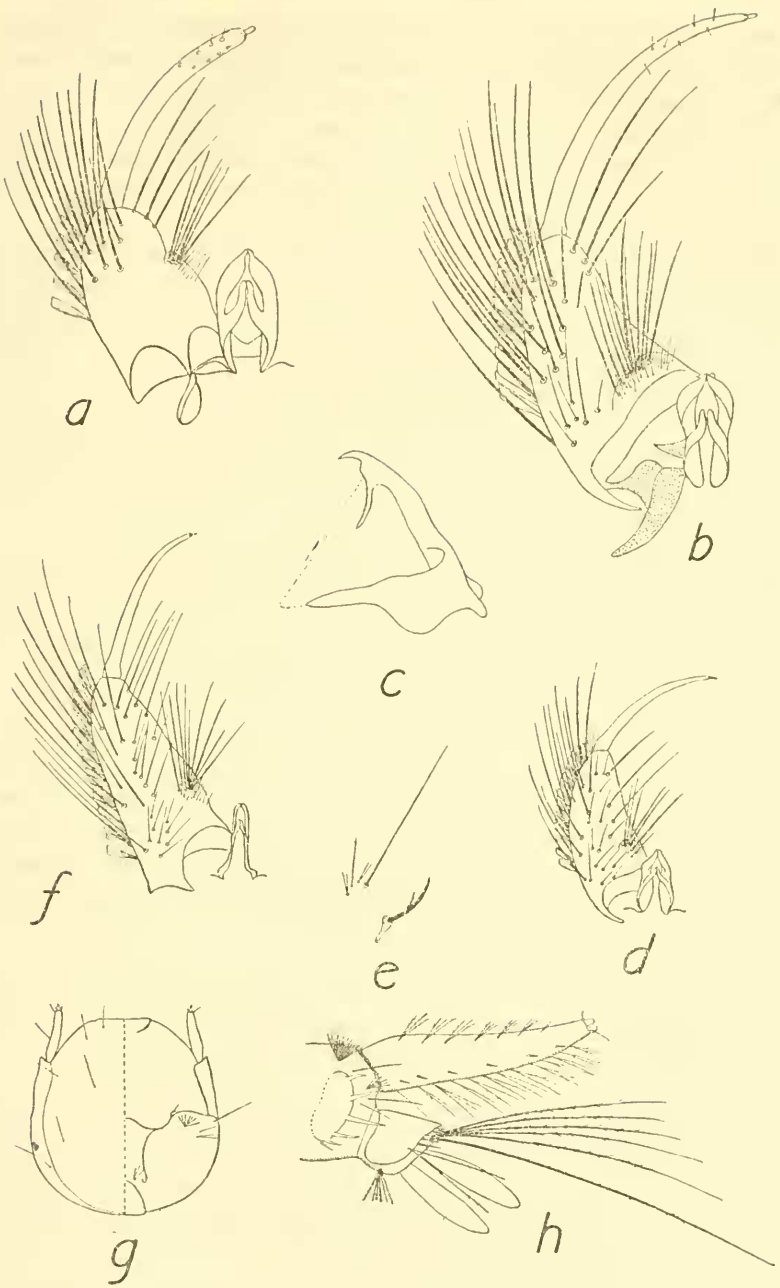

FIGURE 34.—*a*, *Tripteroides lipovskyi*, new species, sidepiece, clasper, and mesosome of male genitalia; *b*, same of *T. solomonis* (Edwards); *c*, *T. stonei*, new species, lateral aspect of tenth sternite of male genitalia; *d*, *T. coheni*, new species, sidepiece, clasper, and mesosome of male genitalia; *e*, *T. floridensis* new species, metathoracic spine and mesothoracic hairs of larva; *f*, *T. stonei*, sidepiece, clasper, and mesosome of male genitalia; *g*, larva of *T. floridensis*, dorsal (left) and ventral (right) aspect of head; *h*, larva of *T. floridensis*, terminal abdominal segments.

Clypeus dark brown, bare. Antenna 0.80 of proboscis; torus dark brown, with minute light hairs; flagellar whorls scanty; last two segments elongate, with denser pubescence, penultimate equal to three preceding segments, terminal 1.5 as long as penultimate. Vertex clothed with broad appressed dark scales, except for a narrow light line along eye margins and a pair of lateral white-scaled patches; erect occipital scales short, white in the center, dark laterally.

Thorax: Scutal integument dark brown, thick shaggy vestiture of mixed broad and rather narrow curved, appressed, dark, bronzy scales, a few narrow, white scales on anterior promontory; dorsocentral and acrostichal bristles absent; prescutellar bristles usually two to four pairs; numerous bristles on anterior promontory and supraalar areas; all bristles dark brown. Scutellum dark, completely covered with very broad, appressed, flat, dark, bronzy scales; bristles dark brown. Postnotum brown, darker centrally; two to four minute hairs usually present on lower central portion. Pleural integument rather light brown, less heavily sclerotized areas tan; upper part of propleuron, lower anterior part of sternopleuron, middle posterior part of mesopleuron, meron and metameron bare; pronotal lobe and posterior pronotum white-scaled at least on lower half, frequently posterior pronotum entirely white-scaled; remainder of pleura completely covered with broad, appressed, translucent, white scales. Pleural bristles: anterior pronotals four to six dark bristles above and a number of lighter, weaker bristles below; one dark posterior pronotal; spiraculars usually two or three dark bristles, sometimes as many as five; propleurals four to six light hairs; lower sternopleurals six to eight light hairs; one to three upper sternopleural hairs occasionally present; prealars three to six dark bristles; upper mesepimerals 10 to 12 light hairs. Halteres light and bare on base and lower part of stem, upper part of stem and knob dark-scaled.

Wings: Scales all dark. Outstanding scales broad on all veins dorsally, narrow on lower surface of veins 3 to 6. Bases of fork cells approximately equidistant from wing base. Fringe mostly dark. Squama fringed.

Legs: All dark bronzy except for white-scaled coxae and trochanters and conspicuously light-scaled ventral surfaces of all femora; lower surface of all segments somewhat lighter. Enlarged claw of front tarsus toothed at apical third, that of middle tarsus simple. Apex of hind tibia and base of first hind tarsal segment with specialized hairs and scales. Hind tibia 0.9 of middle tibia.

Abdomen: Very dark iridescent bronzy dorsally; lateral portions of tergites light-scaled (invisible from above); ventral surface uniformly white-scaled. First tergite with numerous light hairs, eighth segment with strong dark bristles; bristles on other segments very sparse.

Genitalia (figs. 33, *e*; 34, *c*, *f*) : Sidepiece (fig. 34, *f*) conical, densely covered with scales laterally and ventrally, dorsal surface with bristles only, bristles present on basal portion; basal lobe poorly developed, with 7 to 10 large bristles and numerous smaller bristles and hairs; clasper long, slender, smooth, with a short terminal spine. Mesosome (fig. 34, *f*) simple, very slender, composed of two lateral plates, each with an apical ventral spur and two dorsal projections. Tenth sternite (fig. 34, *c*) with a single strong apical tooth; basal arm expanded at base, slender beyond the middle. Ninth tergite (fig. 33, *e*) with a deep, narrow emargination, usually less than half as wide as one of the lateral lobes; lobes truncate at apex, with 8 to 16 strong bristles along apical margin, arranged in two irregular rows, bristles not flattened, relatively slender.

Female.—Very similar to the male, except for sexual characters. Terminal antennal segments not elongate. Proboscis 1.1 to 1.2 as long as femur, slightly shorter than abdomen. Palpi 0.21 to 0.23 of proboscis, terminal segment either without apical bristles or with two slender bristles arising side by side. Pronotal lobes and posterior pronotum usually almost completely white-scaled.

Pupa (fig. 37, *d*).—Cephalothorax: Dorsal surface and base of wing cases darkly pigmented; remainder paler, yellowish brown. Trumpet darkly pigmented throughout, uniformly reticulate; index of length to median width a little less than 3.5 to 1; somewhat swollen just before middle and compressed laterally near apex; inner wall conspicuously separated from outer is basal half or more; opening small, slightly oblique, basal notch very shallow. Hair 1 very long, always simple, darkly pigmented (black) ; hairs 2 and 3 small, inconspicuous, simple, hair 3 larger; hairs 4 and 5 inconspicuous, about the same length, simple or double; 6 very small; 7 fairly long, usually double; 8 and 9 weak, shorter than trumpet, usually simple; 10 double, almost as long as 11 but poorly pigmented; 11 and 12 almost equal in size, well pigmented, usually simple, may be double on apex.

Abdomen: Usually pigmented a very deep chocolate brown with yellow tinge, posterior segments lighter. First segment: float hair a fairly well developed dendritic tuft; hairs H and L very small; U minute; M small, branched; S rather short, simple; T about three-fourths of K, simple; K simple, long, well-pigmented. Hair B (8) on segments IV to VI very long, simple, moderately stout, attenuated on apex; that of IV extending beyond apical margin of segment V; on segments II and III, considerably shorter and less well developed; very short, unpigmented on VII; all inserted near apical margin. Hair C (10) small, inconspicuous, lightly pigmented, branched on basal segments, usually simple on posterior segments. Hair C′ simple, very short, inconspicuous, inserted at about a sixth or seventh from apex of segment; laterad of C, especially noticeably on segments IV

to VI. Hair A very small, unpigmented, inserted on lateral border, or slightly dorsad, on segments II to VI; on segments VII and VIII a large fan-shaped tuft with barbed branches, inserted well away from posterolateral angle on ventral surface of VIII, near posterolateral angle on dorsal surface on segment VII; that of VIII longer than paddles. Hair 2 of segment II inconspicuous, shorter or almost equal to B, usually simple. Paddles light, yellowish brown, rather short; inconspicuous fringe of short, submarginal hairs on apex, continued basally, especially on inner margin; no apical hair, midrib rather poorly developed, evanescent at tip; roughly triangular, with apex only slightly produced, rounded; inner margin about one-third width of outer.

Male genitalia: Genital lobes extending to about five-sixths of paddles, slightly longer than wide, sides curved, apex rounded. Anal lobe (segment IX) about half as long as genital lobes and three-fifths as wide, roughly triangular but rounded on apex.

Female genitalia: Genital lobes a little less than half as long as the paddles, broadly rounded. Anal lobe about one-sixth shorter than genital lobes, same width at base, roughly triangular but rounded at apex.

Larva (fig. 35, *d-f*).—Head (fig. 35, *d*): Slightly longer than wide, uniformly pigmented a light brown. Antenna cylindrical, very short, smooth; shaft hair short, simple, placed at two-thirds from base or beyond. Dorsal head hairs very slender and practically invisible: hair A usualy simple; B very long and stronger, simple; C usually double or triple; d long and simple; e simple; f usually double; ocular simple. Ventral head hairs fairly well developed: postmaxillary very conspicuous, black, about as long as the antenna; infraorbital usually 3-branched; submental placed far forward. Clypeal spines very slender and lightly pigmented. Maxilla elongate, with several greatly developed articulated spines; the largest spine about a quarter longer than the next largest; other spines gradually shortened; all the spines lightly pigmented and rather slender; largest spine at least as long as the body of the maxilla. Labral tuft well developed, at least three times as wide as one of the clypeal spines.

Thorax: Prothorax with a pair of stellate tufts dorsally and another pair laterally, three or four branches in each tuft. Metathorax with a pair of stellate hairs dorsally in line with inner prothoracic tufts, usually two to four branches in each tuft, occasionally reduced to a single spike. Stellate tufts absent on mesothorax. No large spines or thickened hairs laterally. Metathorax with a large dorsolateral 7- to 12-branched tuft; branches very long, slender, barbed.

Abdomen (fig. 35, *e, f*): Stellate tufts long, black, conspicuous, with three or four barbed branches. On first segment two stellate tufts on each side dorsally, arising from a common basal tubercule; on follow-

ing segments (fig. 35, *e*) on each side dorsally a stellate tuft and a single, long spike hair anterior to it and arising from the same tubercle or from a separate tubercle. Comb composed of four to eight scales with pointed ends and basal denticles. Pentad hairs weakly developed except for hair 1, which is a stellate tuft of 5 to 12 branches arising from a basal tubercle; hair 3 usually 4-branched; 5 double or triple; 2 and 4 usually simple. Siphon lightly pigmented, index 2.5, or less; acus absent; parallel-sided at basal fourth, then attenuated to about a third of basal width at apex; pecten teeth at most five on each side, usually three or four, light in color, absent from basal half; an irregular row of 8 to 10 dorsal hair tufts, each with three or four barbed branches, about as long as width of siphon; 10 to 14 ventral hair tufts, the basal two are paired and 4- to 6-branched, remainder usually in an irregular single row and with two or four barbed branches; a strong curved apicodorsal hair; ventral valve with a long 2- to 4-branched hair. Anal segment with a small, black, incomplete saddle, posterior margin with four or five small denticles; saddle hair simple, stout, and long; ventral brush reduced to a pair of tufts, each with six to eight very long, barbed branches; dorsal brush very long, hairs barbed, ventral subcaudal tuft simple, dorsal with seven or eight branches; gills longer than saddle hair, attenuated.

Types.—U. S. N. M. No. 59087 (holotype, allotype, and paratypes): Holotype ♂ (856–22), allotype ♀ (856–21), with larval and pupal skins, bred from larvae collected in coconut shell, Poha River Valley, Guadalcanal, February 7, 1944 (J. J. Cuccio).

Paratypes (25 ♂, 48 ♀) all bred from larvae collected in various localities on Guadalcanal, as follows: 5 ♂, 5 ♀ (7) in coconut shells, Doma Cove, October 21, 1943 (JNB); 1 ♀ (19) in tree hole, Still River, Doma Cove, October 25, 1943 (L. J. Lipovsky); 2 ♂, 3 ♀ (354–3) in bamboo stubble, Wright's Creek, Matanikau Valley, May 6, 1944 (L. J. Lipovsky); 1 ♀ (401–41) with larval and pupal skins, in tree hole, Mamara, May 25, 1944 (S. Civinski); 1 ♀ (501–23) with larval and pupal skins, in tin can, Tandonu Swamp, Tassafaronga, July 11, 1944 (M. Cohen, A. W. Barnes); 3 ♀ (508–11, 13, 14) with larval and pupal skins, in shell casings, Tassafaronga, July 20, 1944 (F. B. Wysocki); 1 ♀ (542–3), in tin can, Marine Creek, Matanikau Valley, July 31, 1944 (L. J. Lipovsky, M. Cohen); 4 ♀ (614–11, 13, 14, 15) with larval and pupal skins, 4 ♂, 7 ♀ (614), in tin cans, Tassafaronga swamp, August 18, 1944 (M. Cohen); 1 ♂ (643–22), 4 ♀ (643–21, 23, 24, 25) with larval and pupal skins, 4 ♀ (643–2), in coconut shells, Mamara Swamp, September 7, 1944 (F. B. Wysocki, V. R. Roa); 3 ♂, 4 ♀ (696–2), in coconut shells, mouth of Balasuma River, October 25, 1944 (JNB); 1 ♂, 3 ♀ (856–2) same data as for holotype and allotype; 1 ♂ (965–11), 1 ♀ (965–12) with larval and pupal skins, 6 ♂, 5 ♀

(965–1) in coconut shells, mouth of Balasuma River, April 30, 1945 (M. Cohen, F. B. Wysocki, J. J. Cuccio, V. R. Roa). Paratypes to be deposited in the collections of Cornell University, British Museum (Natural History); U. S. National Museum; and Council for Scientific and Industrial Research, Canberra, A. C. T., Australia.

This species is named in honor of Dr. Alan Stone, who gave encouragement and assistance throughout this study.

Taxonomic discussion.—*T. stonei* is a member of the *filipes*-group of *Rachisoura* and resembles closely the other two members of the group found in the Solomons.

The structure of the male palpi (four to six long bristles on the apical segment) will serve to distinguish *stonei* from all other species of this group. *T. torokinae* resembles it in this respect, but the bristles on the apical segment of this species are much more numerous, usually at least 25 or more. The ninth tergite of the male is very distinct from that of *mathesoni*, but it can be separated from *torokinae* only by the flattened bristles in the latter. The females of *stonei* cannot always be separated from those of *mathesoni* as the amount of light scaling on the posterior pronotum shows considerable variation. The female palpus of *stonei* sometimes shows two slender bristles at the apex of the terminal segment. In *mathesoni* the bristles are always absent, and in *torokinae* they are three or four in number and arise separately, while in *stonei* they arise side by side. The larvae of *stonei* are easily separated from *mathesoni* by the characters used in the key, but they are apparently very similar to those of *torokinae*.

Other features distinguishing *stonei* from Papuan forms are discussed under *mathesoni*.

Variation.—As with *mathesoni*, a study of 28 individual rearings from Guadalcanal reveals considerable variation in individuals of this species. In the adults the postnotal bristles are frequently absent, the spiraculars may be increased to six, the upper sternopleurals are often absent, when present they are very weak. The prescutellars may be increased to four pairs in the more vigorous individuals. Large specimens show completely white posterior pronota, but in smaller, weaker specimens the light scaling may cover slightly less that the lower half of this sclerite. The maxillary spines of the larva vary a great deal in size; frequently the small spines are considerably enlarged, so that there is little difference between adjacent spines and little differentiation of the largest spine from the others. The abdominal and thoracic stellate tufts are quite variable in length, as well as in the number of branches, but are always black. The number of comb scales is not constant, even on the two sides of the same individual, but the variation in number is not so great as in *mathesoni*.

T. stonei shows considerable geographical variation, at least in the female. All the specimens of this sex collected on Arundel Island have

two slender bristles on the apex of the palpus; the males collected at the same time agree very well with specimens from Guadalcanal. Development of apical bristles in females from Guadalcanal is very infrequent, only four specimens showing one weak bristle. New Georgia specimens agree with those from Guadalcanal. It is quite possible that we are dealing with two very similar species or perhaps with one extremely variable species. To settle this point, it would require a larger number of specimens than are available for this study and long series of individual rearings. No individual rearings have been made outside of Guadalcanal. For the present time the author prefers to consider these forms as a variant of *stonei*.

No constant differences have been noted in specimens originating in different breeding habitats.

Specimens examined: 28 individual rearings, 179 adults, 215 larvae, 105 pupae.

Biology.—T. stonei larvae are commonly found in coconut shells, tree holes, and bamboo stubble. They are also very commonly collected in various artificial containers, such as tin cans and shell casings. Our records indicate that they never utilize leaf-axils of taro. They are more numerous during the rainy season, but they maintain themselves throughout the year, as there is usually sufficient rainfall to provide breeding places.

The larvae are predaceous and cannibalistic, as those of *mathesoni*. They have the same habit of resting quietly on their backs at the bottom of their breeding places with the enlarged hooked maxillae projecting away from the head. The length of the aquatic cycle appears to be similar to that of *mathesoni*.

In the field the larvae are easily recognized by their large size and their elongate white bodies covered with conspicuous black-spiked stellate hairs. They cannot be confused with the larvae of other species of *Tripteroides* occurring in similar habitats because of the poor development of the stellate hairs and the length of their bodies.

The adults are commonly seen in the field resting in coconut shells and on buttresses of large trees in swampy jungle areas. An occasional specimen has been collected attempting to bite during the day. This species apparently is not attracted to lights.

Several species have been collected in association with *T. stonei: T. lipovskyi* in coconut shells, bamboo stubble, and tree holes; *T. solomonis* in bamboo stubble; *Culex pullus*-group in coconuts; *Aedes albolineatus* Theobald in coconuts and tin cans; *Culex papuensis*-group in coconuts; and *Uranotaenia quadrimaculata* Edwards in tin cans. A dozen or more individuals of *stonei* are usually found in one breeding place and are not numerous enough to completely eliminate all their prey.

Distribution.—Solomon Islands: *Guadalcanal:* Generally distrib-

uted on north-central and northwest coast (JNB et al., P. W. Oman) [U. S. N. M., CU, JNB]. *New Georgia:* Segi Point (C. O. Berg) [U. S. N. M.], Munda Point (J. G. Franclemont) [U. S. N. M., CU, JNB]. *Arundel:* (J. G. Franclemont) [U. S. N. M., CU, JNB].

TRIPTEROIDES (RACHISOURA) TOROKINAE, new species

FIGURE 33, *a*, *c*

Distinctive characters.—ADULTS: Unornamented, wing scales all broad dorsally. Proboscis 1.2 as long as front femur. Male palpi with a brush of 20 to 30 long bristles on apex; without the bristles 0.23 of proboscis. Female palpi 0.17 of proboscis, terminal segment with two to four strong bristles. Ninth tergite of male with a deep, narrow emargination; bristles on lobes flattened. Prescutellar bristles reduced, at most a single weak pair.

LARVAE (third instar only): Maxilla with greatly developed terminal spines. Thoracic spines absent. Middle abdominal segments dorsally, on each side, with a stellate tuft and a single small spike arising just anteriorly. Pecten teeth four or five on each side. Siphon light brown, index about 2.5. Comb scales in a single row, four to seven in number.

Description of the male.—Wing: 3–4 mm.

Head: Proboscis about 1.2 as long as front femur, slightly shorter than abdomen, dark-scaled, labella lighter. Palpi (exclusive of terminal bristles) approximately 0.23 of proboscis, dark-scaled; apical segment short, but as wide as preceding segment, not conspicuously bent internally, with a tuft of 20 to 30 long, dark bristles; bristles almost two-thirds as long as the rest of the palpus (fig. 33, *a*). Clypeus dark, bare. Antenna about 0.90 of proboscis; torus piceous, with minute light hairs; flagellar whorls scanty; last two segments elongated, with denser pubescence, penultimate equal to three preceding segments, terminal a third longer. Vertex clothed with broad, appressed, dark scales, except for narrow light line around the eye margins and a pair of lateral white-scaled patches; erect occipital scales short, white in the center, dark laterally.

Thorax: Scutal integument very dark; thick, shaggy vestiture of broad, appressed, curved, dark, bronzy scales, some narrower scales also present, a few narrow white scales on anterior promontory; scales on supraalar areas broader and lighter; no dorsocentral or acrostichal bristles; prescutellars usually absent, sometimes a single pair of weak bristles is present. Scutellum dark, completely covered with very broad, appressed, flat, dark, bronzy scales; bristles dark brown. Postnotum brown, darker centrally, bare. Pleural integument dark brown, unsclerotized areas light; upper part of propleuron, lower anterior part of sternopleuron, middle posterior part of mesopleuron, meron and metameron bare; remainder of pleura covered with broad, appressed,

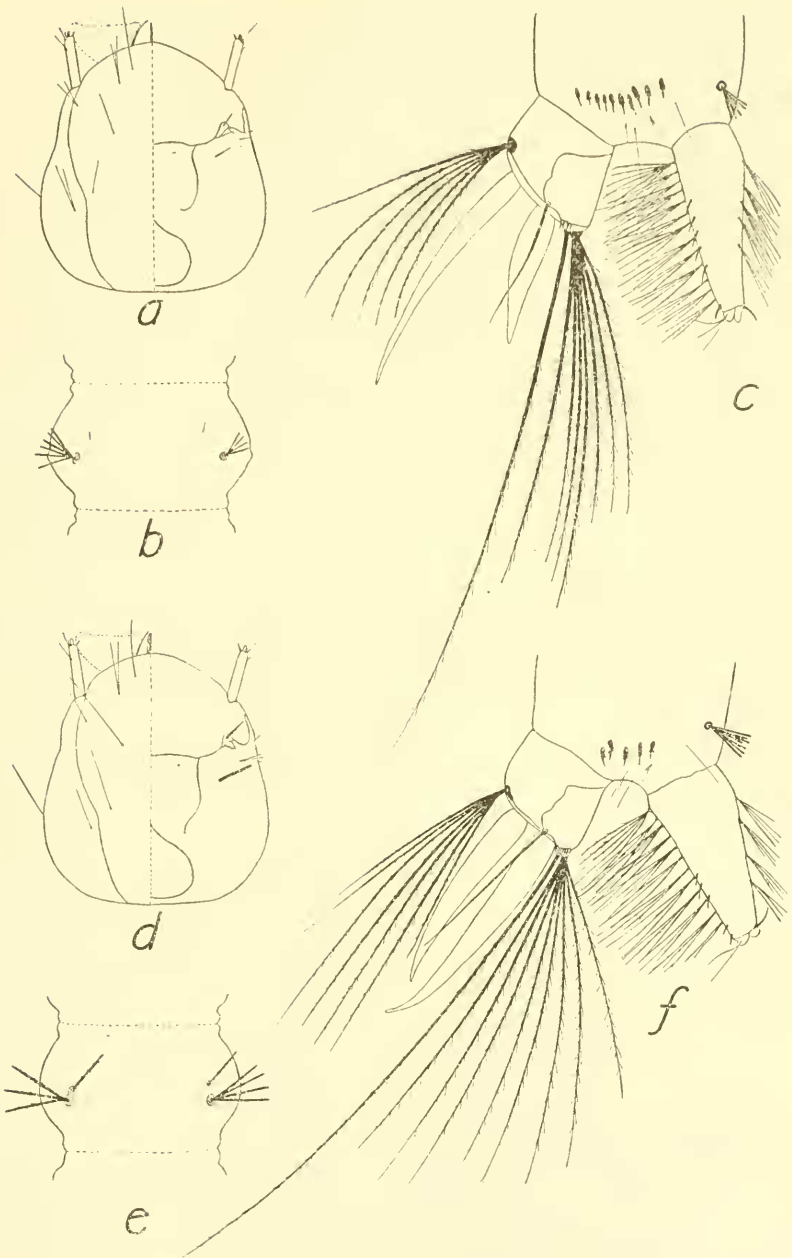

FIGURE 35.—*a*, Larva of *Tripteroides mathesoni*, new species, dorsal (left) and ventral (right) aspects of head; *b*, same, fourth abdominal segment showing dorsal hairs (other hairs not shown); *c*, same, terminal abdominal segments; *d*, larva of *T. stonei*, new species, dorsal (left) and ventral (right) aspects of head; *e*, same, fourth abdominal segment showing dorsal hairs (other hairs not shown); *f*, same, terminal abdominal segments.

translucent, white scales, which become darker on upper parts of pronotal lobes and anterior pronotum. Pleural bristles: anterior pronotals four to six dark bristles above and a number of lighter hairs and bristles below; one dark posterior pronotal; spiraculars three small dark bristles; propleurals four to six light hairs and bristles; lower sternopleurals a group of light hairs; usually one light upper sternopleural; three to six dark prealars; upper mesepimerals 10 to 12 light hairs. Halteres light and bare on base and lower part of stem, upper part of stem and knob dark-scaled.

Wings: Scales all dark. Outstanding scales broad on all veins dorsally, narrow on lower surface of veins 3 to 6. Bases of fork cells equidistant from wing base, that of lower fork cell may be slightly nearer. Fringe mostly dark. Squama fringed.

Legs: All dark-scaled except for white-scaled coxae and trochanters; ventral surfaces of all femora and tibiae light-scaled. Fifth tarsal segment of front leg modified; enlarged claw with tooth near apex; that of middle leg unmodified, claws subequal, simple. Apex of hind tibia and base of first hind tarsal segment with specialized hairs and scales. Hind tibia 0.9 of middle tibia.

Abdomen: Very dark, iridescent, bronzy dorsally; lateral portions of tergites light-scaled (invisible from above); ventral surface uniformly white-scaled. Bristles largely restricted to the first and terminal segments.

Genitalia (fig. 33, *c*): Sidepiece conical, densely covered with scales laterally and ventrally; dorsal surface with bristles only; bristles present on basal portion. Basal lobe with about 10 large bristles and numerous smaller bristles and hairs. Clasper long, slender, smooth, with a short terminal spine. Mesosome simple, slender; composed of two lateral sclerotized plates, each with two long dorsal projections and a short apicoventral spur. Tenth sternite with a strong, single apical tooth; basal arm expanded at base, abruptly narrowed at middle. Ninth tergite (fig. 33, *c*) with a triangular median emargination, at its widest point less than half as wide as the lobes; lobes wide and short, each with about 14 flattened, expanded bristles with very fine curved ends; bristles arranged in irregular double row on apex of lobes, inner dorsal bristles usually very wide.

Female.—Essentially as the male, except for sexual characters. Terminal antennal segments not elongate, whorls very sparse. Proboscis a little less than 1.1 of front femur, slightly shorter than abdomen. Palpi stout, 0.17 of proboscis, terminal segment with two to four strong dark bristles arising on the apex, bristles widely spaced at base. Usually six spiracular bristles and one postnotal. Claws simple and normal on all legs.

Pupa.—Unknown.

Larva.—Four third-instar larvae associated with the adults of this

species are available for study. They resemble very closely those of *stonei* and it can be surmised that the fourth-instar larvae will show similarity also. A very short description will suffice to show the essential features.

Maxillae elongate, with large terminal spines. Postmaxillary hair dark, well developed. Thoracic spines absent. Prothorax with two pairs of spike hairs. Metathorax with a long 2-branched spike hair dorsally. Middle abdominal segments dorsally on each side with a dark stellate tuft of two to four branches and a single small spike arising just anteriorly. Pecten teeth four or five on each side. Siphon light brown, index about 2.5. Comb scales in a single row, four to seven on each side.

Types.—U. S. N. M. No. 59088 (holotype, allotype, and paratypes):

Holotype ♂ (G–172), Torokina, Empress Augusta Bay, Bougainville, February 3, 1944 (A. B. Gurney).

Allotype ♀, Empress Augusta Bay, Bougainville, January 18, 1944 (C. R. Bruck).

Paratypes (3 ♂, 5 ♀): 3 ♂, 1 ♀ (G–172), same data as holotype; 1 ♀ same data as allotype; 3 ♀ (G–224), Empress Augusta Bay, Bougainville, February 18, 1944, (A. B. Gurney) [U.S.N.M., CU, JNB].

Taxonomic discussion.—*T. torokinae* resembles *stonei* quite closely but can be separated from it readily by the large number of apical bristles on the male palpus and the normal simple claws on the middle legs in this sex, the apical bristles on the palpus of the female and the reduction of prescutellar bristles in both sexes. The same characters will serve to separate it from all the other members of the *filipes*-group of the subgenus *Rachisoura*. The larvae of *torokinae* resemble those of *stonei* in the third instar, but, as no full-grown larvae are available, no definite separation can be made at the present time.

T. torokinae is restricted to the northern Solomons, where it seems to replace *stonei*. The latter species has not been reported on Bougainville or Treasury Islands.

Variation.—The small number of adults available for study are very uniform in their characters and show no overlapping with *stonei*, the only species with which it could be confused. There is considerable variation in the number of spiracular bristles in the female, from three to seven, although usually they are six in number.

Specimens examined: 11 adults, 4 third-instar larvae; no individual rearings.

Biology.—The larvae of *torokinae* have been collected in tree holes in association with those of *T. binotata*, new species, and *T. solomonis* Edwards. No information is available on the habits of the adults.

From the similarity in the larvae of this species and *stonei* it would appear that they are also predaceous.

Distribution.—Solomon Islands: *Bougainville:* Empress Augusta

Bay (A. B. Gurney, C. R. Bruck) [U.S.N.M.]. *Treasury:* Sterling Island, November 1, 1943 (K. L. Knight, No. 861) [U.S.N.M.].

TRIPTEROIDES (MIMETEOMYIA) SOLOMONIS (Edwards)

FIGURES 33, *f*, *i*; 34, *b*; 36, *e*; 37, *c*

Rachionotomyia solomonis EDWARDS, 1924, p. 363; 1925, p. 257; 1926, p. 109.—PAINE and EDWARDS, 1929, p. 308.

T. (*Mimeteomyia*) *solomonis* EDWARDS, 1932, p. 77.

T. (*M.*) *solomonis* (Edw.), LEE, 1944, p. 20; 1946, p. 264.

T. solomonis (Edw.) KNIGHT, BOHART, and BOHART, 1944, p. 20.

FIGURES (larva): Paine and Edwards, 1929, p. 309 (maxilla, thorax, terminal segments of abdomen); Lee, 1944, p. 20 (terminal abdominal segments).

Holotype female caught in house, Tulagi, Guadalcanal Island [should be Florida group], July 1923 (Dr. A. G. Carment) [British Museum (Natural History)].

Distinctive characters.—ADULTS: Unornamented. Outstanding wing scales all narrow on dorsal surface. Proboscis stout, shorter than abdomen. Scutal vestiture very dark; head and abdomen dark, with purplish-blue gloss. Male palpi 0.75 to 0.80 of proboscis, female palpi, 0.15 of proboscis. Abdomen with triangular lateral white spots. Ninth tergite of male with a single row of four to six long bristles on each lobe.

LARVAE: Mesothoracic and metathoracic spines present. Maxilla without terminal spines. Thorax and abdomen with numerous extremely large stellate tufts. Comb scales arising from a sclerotized plate, ventral comb scales smaller, arising independently of plate, large scales pointed. Siphon dark, index 2.5 to 3, apex about half the width of base. Pecten of four or five teeth, usually restricted to basal two-thirds.

Description of male.—Wing: 2–3 mm.

Head: Proboscis 1.2 of front femur, about 0.90 of abdomen, rather stout, dark-scaled. Palpi 0.76 of proboscis, slender, dark-scaled; terminal segment with several long dark bristles at apex. Clypeus dark brown, bare. Antenna 0.80 to 0.85 of proboscis, torus rugosely pollinose, dark; flagellar whorls very dense; first flagellar segment with rather long, narrow, light scales; penultimate segment equal to about four preceding segments, with long hairs; terminal segment 0.75 of penultimate, with short pubescence. Vertex clothed with broad, appressed, dark scales except for lateral white patches and a narrow, but conspicuous, white line along eye margins. Occipital scales all dark, rather long.

Thorax: Scutal integument very dark; thick, shaggy vestiture of rather narrow, long, curved, appressed, dark, bronzy scales, a conspicuous patch of broader, pure white scales in supraalar area, a small

number of narrow, white scales on central portion of anterior promontory, and a few dingy white scales along the margin of the prescutellar "bare space." Dorsocentral and acrostichal bristles absent; three pairs of prescutellars; usual bristles on anterior promontory and supraalar areas; all bristles very dark. Scutellum light brown, covered with broad, appressed, iridescent, dark scales. Postnotum very dark, with gray pollinose lines; bristles and hairs absent. Pleural integument black with dense covering of broad, appressed, white scales; pronotal lobes entirely white-scaled; posterior pronotum with broad white scales below and narrower, smaller dark scales above; remainder of pleura densely covered with pure white scales except for bare upper part of propleuron, lower anterior part of sternopleuron, posterior part of mesepimeron, meron, and metameron. Pleural bristles: anterior pronotals eight or nine dark bristles; no posterior pronotal; two spiraculars; three propleurals; a number of weak, light-colored lower sternopleurals; no upper sternopleurals; four or five prealars; a group of light upper mesepimerals. Halteres yellow-brown and bare at base and lower part of stem, upper part of stem and knob bronzy-scaled.

Wings: Scales all dark. Outstanding wing scales long and narrow on all veins dorsally. Base of upper fork cell closer to base of wing than that of lower fork cell. Fringe dark. Squama fringed.

Legs: All dark except as follows. Coxae and trochanters mostly white-scaled, integument light. Front and middle femora narrowly white-scaled on lower surface; front and middle tibiae with some pale scales ventrally. Hind femora and tibiae more extensively white-scaled ventrally. All tarsi dark. Hind tibia and base of first hind tarsus with specialized hairs. Enlarged claws of front and middle legs with a slender tooth on basal half.

Abdomen: Dark, iridescent, purplish blue with white lateral spots. First tergite completely scaled, dark centrally, white on lateral lobes. Second tergite with a large, white lateral spot extending from base to apex. Tergites 3 to 7 with triangular lateral white spots produced mesad on apex of segments, but not meeting on midline. Sternites 2 to 7 white-scaled, 1 bare.

Genitalia (figs. 33, *f*, *i*; 34, *b*). Sidepiece (fig. 34, *b*) conical, densely covered with scales laterally and ventrally; dorsal surface with bristles only, bristles present on basal portion; basal lobe poorly developed, with four to six large bristles, one of these being considerably thicker and longer than the others, numerous smaller bristles and hairs; clasper long, slender, apical third to half with a few small, slender hairs arising from dorsal, lateral and ventral surfaces, a short elongate ovoid terminal spine. Mesosome (fig. 34, *b*) simple, broad; composed of two lateral plates, each with an apical ventral spur and two dorsal projections. Tenth sternite (fig. 33, *i*) ending in several teeth, usually

4; basal arm expanded at base, slender beyond the middle. Ninth tergite (fig. 33, *f*) with a deep median emargination, narrower than one of the lobes; lobes variable in length, usually twice as long as wide; three to six very long bristles or spines deeply inserted and evenly spaced on the posterior margin of each lobe, beginning internally at about the middle of the lobe and ending on outer apical angle.

Female.—Very similar to the male, except for sexual characters. Terminal antennal segments not elongate. Proboscis 1.1 of front femur, about 0.90 of abdomen. Palpi about 0.15 of proboscis, terminal segment without conspicuous bristles.

Pupa (fig. 37, *c*).—Cephalothorax: Dorsal surface and basal portions of wing cases darkly pigmented, remainder light. Trumpet darkly pigmented throughout, uniformly reticulate; index of length to median width about 2.5 to 1; width more or less uniform beyond base; inner wall well separated from outer in basal third or more; opening small, oblique. Hair 1 very long, double from base; 2 and 3 well developed, conspicuous, usually 2-branched; 4 and 5 about equal in size, 4 triple, 5 double; 6 shorter, simple; 7 longer than 4, simple; 8 and 9 longer than trumpet, 8 double or triple, 9 usually simple; 10 minute; 11 and 12 long, simple, 12 longer.

Abdomen: Darkly pigmented; anterior segments darker; posteriorly segments laterally lighter; unpigmented areas at the base of the larger hairs. First segment: float hair well developed, flattened, branches arising in one plane; hairs S, T, U not separated as a group, placed near the others; H and L small, H simple, L usually double; U minute; K and S long, simple; M and T shorter, simple or double. Hair B (8) very long and simple on segments IV, V, and VI, usually extending beyond apex of following segment, inserted well away from margin; on segments II and III shorter, simple; on VII usually double, short. Hair C (10) not conspicuous, usually branched, larger on anterior segments. Hair C′ rather well developed, on anterior segments particularly; simple, inserted mesad of C on all segments, but most noticeably on segments IV to VI, removed about a fourth to third from apex of segments. Hair A small but conspicuous, spine-like, unbranched on segments II to VI; on segments VII and VIII a large fan-shaped tuft with barbed branches, that of VIII extending beyond apex of paddles; A′ on segment VIII extending to beyond third of paddles. Hair 2 of segment II very long, usually twice as long as B, inserted at about middle of segment; most conspicuous hair of this segment.

Paddles short, without marginal fringe or apical hair; midrib poorly sclerotized, evanescent beyond middle; roughly triangular; apex (at end of midrib) rounded; inner half more than a third as wide as outer.

Male genitalia: Genital lobes about three-fifths of paddles, slightly longer than wide; curved laterally; rounded at apex; anal lobe (segment IX) about five-sevenths of width and extending about two-thirds length of genital lobes.

Female genitalia: Genital lobes broadly rounded, extending less than half length of paddles; anal lobe narrower, broadly triangular but rounded at apex, extending to within one-fourteenth of apex of genital lobes.

Larva.—Head (fig. 36, *e*): Slightly wider than long, uniformly pigmented a light brown. Antenna a little less than half as long as the head, projecting well beyond the anterior margin of the head; almost cylindrical on basal two-thirds, except for an external bulge near base, apical third tapering; shaft hair arising on inner surface at point of narrowing of antenna, hair stout and usually bifid near its middle, almost a third as long as the antenna. Dorsal head hairs well developed but light in color: A usually double; B usually 3- or 4-branched; C usually triple; d usually bifid near its middle; e and f simple; occular simple. Ventral head hairs well developed and prominent: basal with one to three spikelike branches and a smaller stellate tuft arising from same tubercle; postmandibular and postmaxillary stellate tufts of four or five spikes, postmaxillary longer; basal maxillary single or double spike; submental branched, inconspicuous, arising near occipital foramen; infraorbital simple, long, inconspicuous. Clypeal spines rather slender; majority of specimens show a tuft of many fine hairs at apex, in others the spines are longer and without a tuft at apex. Maxilla longer than broad, with a large tuft of serrate leaflets on apex, small teeth present on the internal margin.

Thorax: Stellate tufts numerous and well developed, about 10-branched; individual spikes ending in two or more very short points, shafts not conspicuously barbed. Prothorax with six pairs of stellate tufts (hairs 1, 3, 4, 7, 8, 0) dorsad of the pleural group of hairs; on each side of middorsal line two stellate tufts (hairs 1 and 3) arising from a common tubercle. Mesothorax laterally with a stout trifid spine (hair 8) arising from a very large plate, latter with a stellate tuft (hair 7) and a simple hair (hair 6); a pair of stellate tufts dorsally (hair 1). Metathorax laterally with an even stouter trifid spine (hair 7) arising from a very large basal plate, latter with a simple hair (hair 6); four pairs of stellate tufts (hairs, 1, 3, 5, 8) dorsad of pleural group. Ventral stellate tufts present, well developed.

Abdomen: Stellate tufts numerous and well developed, usually about 10-branched, present on dorsal, lateral, and ventral surfaces; two pairs of tufts on dorsal surface of segments I to VII. Eighth segment with lateral sclerotized plates, six to eight large simple comb teeth arising from each plate, teeth strong, sharply pointed; about four or

five smaller, weaker teeth arising ventrad of the plates on each side. Pentad hairs well developed, all arising from basal tubercles; hair 1 a stellate tuft of about 15 spikes; 2 and 4 long and simple, 3 triple or multiple, 4 multiple. Siphon heavily pigmented, dark, index from 2.5 to 3, lower surface convex, upper convex at base and concave beyond middle, apex about one-half width at base; dorsal and dorsolateral surface with 8 to 12 single, double, or triple short spikes arranged irregularly, apical spike hairlike; ventral surface with a pair of 3-branched tufts at base, followed by a bare space, then with 6 to 10 tufts arranged irregularly in one row or in a partial double row, each tuft with two or three barbed branches; a strong apicodorsal hair; ventral siphonal valve hair simple. Pecten of four or five simple teeth, usually restricted to basal two-thirds of siphon. Anal segment with large, incomplete, darkly pigmented saddle, posterior margin with about 20 sharp teeth; saddle hair usually triple; ventral brush of anal segment reduced to a pair of tufts, each with four or five branches; dorsal brush very long, hairs barbed, ventral subcaudal tuft simple, dorsal with five or six branches; gills short, upper pair 1.5 as long as lower, slightly longer than saddle, rather sharply pointed.

Taxonomic discussion.—*T. solomonis* is a typical member of the *atripes*-group of the subgenus *Mimeteomyia* since it has unornamented head and femora, only narrow, outstanding wing scales, the proboscis stout and shorter than the abdomen, the male palpi almost as long as the proboscis, and the female palpi about one-sixth the length of the proboscis. The larvae of this species are similar to those of the other members of this group in the possession of both mesothoracic and metathoracic spines and the comb arising from a lateral sclerotized plate.

In addition to *solomonis* three other species are placed by Lee in the *atripes*-group: *atripes* (Skuse), *punctolateralis* (Theobald), and *digoelensis* (Brug). *T. digoelensis*, according to Brug's (1934) description, appears quite distinct from the rest in the absence of prescutellar bristles, the presence of yellow spiracular bristles, and the conformation of the lobes of the ninth tergites of the male, as well as the shape and the position of the bristles on the lobes. The separation of the other three species is extremely difficult as all three are apparently quite variable, even the ninth tergite showing no distinctive characters. The most reliable character is the coloration of the scaling of the body and appendages. *T. punctolateralis* is light colored, the head is fawn, the posterior pronotum entirely white-scaled, the scutal vestiture pale brown, the scutellar scales light, the basal third of the male palpus whitish; there is some pale scaling on the proboscis of both sexes, and the white lateral markings on the abdomen are more extensive than in the other two species. *T. atripes*

is somewhat darker than *punctolateralis*, the head is black-scaled, the posterior pronotum pale-scaled below and bronzy or gray above, the scutal vestiture light bronzy, the scutellar scales light bronzy, the male palpi and the proboscis of both sexes entirely dark-scaled. *T. solomonis* is even darker than *atripes* and is best distinguished from this species by the bronzy black scales of the scutum and the purplish-black head, abdomen, and legs. The majority of specimens of *solomonis* from Bougainville show lighter scaling of the scutellum, but these cannot be confused with *punctolateralis* as they do not show any of the other features of the said species.

The separation of *atripes*, *punctolateralis*, and *solomonis* in the larval stage is even more difficult. The comb scales of *solomonis* are not restricted to the sclerotized lateral plates as figured by Edwards (1929); there are several smaller ones arising ventrally and independently of the plate. The large comb scales appear to be distinct from those of *atripes* and *punctolateralis* in that they are usually sharply pointed, while those of the other two are blunt and rounded on the apices. It is possible that other differences exist in the head hairs of the larvae, but there is so much variation in all of these hairs in *solomonis* that such a separation would require the study of large numbers of individuals of the three species.

The larval habitats of the three species are identical as far as can be determined from literature. All three species utilize tree holes and various artificial containers in the neighborhood of human habitations. *T. solomonis*, in addition, has been collected in bamboo stubble. All three frequently attack human beings and may become domestic pests at times.

The similarity in the morphology and biology of these three forms and the extreme variability of *solomonis* (see below under "Variation") lead one to the conclusion that they are closely related. Whether they are distinct species or represent merely geographical subspecies of an actively mutating species remains to be determined. *T. solomonis* is found throughout the Solomons and apparently does not overlap with the other species which occur only in Australia. *T. punctolateralis* has also been reported from Timor as *atripes* var. *occidentalis* Brug (1934). Numerous collections in New Guinea and the New Hebrides made by entomologists in the armed services failed to reveal a representative of this group. The isolation of *solomonis* leads one to speculate as to its origin. It is quite possible that it was originally brought over from Australia as it is more or less a domestic species which could be easily transported by humans. It is believed that the record of *solomonis* from New Caledonia listed below is based on specimens which were accidentally brought over from the Solomons, perhaps by aircraft. It is not known whether *solomonis* is now

firmly established in New Caledonia. Certainly it would have ideal larval habitats available in the city of Noumea.

Variation.—*T. solomonis* is the most variable species of *Tripteroides* encountered in the Solomon Islands. Yet the general basic morphology is strikingly constant in all specimens and is extremely similar to *atripes* and *punctolateralis*.

Twenty-two individual rearings from various larval habitats on Guadalcanal have been thoroughly studied. In the adults the white scaling on the prescutellar area is extremely variable, many specimens showing no light scales at all, others having a conspicuous white area around the "bare space." The light scaling on the supraalar area is quite variable in extent but is always conspicuous. The white scales on the anterior promontory are sometimes reduced. The pleural chaetotaxy is also subject to some variation, in particular the posterior pronotal bristle, which is usually absent but is sometimes weakly developed. The ninth tergite of the male is extremely variable in the shape of the lobes and number of bristles. There appears to be no constant difference between *solomonis* and *punctolateralis* and *atripes* in this sclerite. The larvae show remarkable variation in almost all hairs, and particularly in the head hairs. Edwards (1924), in his original description, states that head hair A is always simple, but that is not the case in our specimens, in which it is usually double or triple and may have as many as five branches. Hairs B and C are frequently 4- or 5-branched but may also be double or triple. The clypeal spines show interesting variation in the presence of a tuft of very fine hairs on the apex, in which case the spines are relatively short; other specimens have long clypeal spines without the terminal tuft. This character is not associated with any other larval or adult character or larval habitat, nor is it sexual. The basal ventral head hair is peculiar in that it is composed of two separate hairs arising from a common base; the anterior hair may be a single spike or may be developed into a stellate tuft of four or five spikes and it is always long; the posterior hair is considerably shorter and may be extremely reduced but is usually a small stellate tuft of three or four branches. The leaflets on the apex of the maxilla in some specimens are much more numerous than in others and, in such cases, show practically no serrations. The thoracic chaetotaxy figured by Edwards (1929) differs from that of any specimen seen during the present study. The inner prothoracic stellate tufts in all specimens seen are actually composed of two large tufts arising one in back of the other from the same tubercle and there is a short simple hair arising from this tubercle; the next dorsal tuft laterally always has at least two branches and is never double; the tubercle of the mesothoracic spine has a large stellate tuft and a simple hair. That the condition shown in Edwards's figure

is normal is doubtful, as over 300 larvae were examined in the course of this study and none showed these characters. On the other hand, Edwards's specimens came from coconuts from the Russell group, and no specimens were studied from this locality in the course of this work. There are other discrepancies in these illustrations and particularly in the comb scales; all specimens seen had several small comb scales arising independently of the sclerotized plate on the ventral surface, Edwards's figure shows the comb scales restricted to the sclerotized plate. The development of the stellate tufts on the thoracic and abdominal segments is subject to considerable variation. Some specimens show very slender, lightly pigmented tufts, while others have stout, dark brown tufts. The comb scales vary considerable in size and number, but they are usually pointed on the apex. Some larvae have the tips of the scales slightly rounded, but none of them approach the condition normally found in *atripes* or *punctolateralis*. The dorsal siphonal hairs vary greatly in position and in the number of branches. The ventral siphonal hairs are even more variable in number and may have three or four branches. The pecten is usually restricted to the basal two-thirds of the siphon but occasionally a small tooth is found near the apex.

No correlation between any of the above variations has been found either in larvae or adults. It was noted that the specimens from bamboo stubble tended to be darker and had better developed stellate tufts with a larger number of branches, while those collected in artificial containers usually had more slender stellate tufts. Larvae from tree holes were intermediate in this respect.

T. solomonis exhibits geographical variation within the limits of the Solomon Islands. The Guadalcanal specimens tend to have less white scaling in the prescutellar area, while in New Georgia, Bougainville, and Treasury Islands the white scaling is very conspicuous. The majority of specimens from Bougainville and Sterling Island in the Treasury group have the scutellar scales quite pale, usually on the median lobe only. These scales appear almost white in certain lights. There are all intergradations from almost white to entirely dark scales, although the latter condition is rare. No other differences were noted in the adults, and the larvae exhibited all the variations seen in specimens from Guadalcanal and showed no constant differences from them.

The northern Solomons (Bougainville and Treasury islands) have two endemic species of *Tripteroides* (*torokinae* and *binotata*) that are not represented in the southern Solomons but that closely resemble species restricted to that area, respectively *stonei* and *lipovskyi*. It is quite possible that the specimens of *solomonis* from the northern Solomons represent a distinct species or at least a geographical race or subspecies. Failing to find any clear-cut differences for these forms

I prefer not to separate them at the present time. The problem of development of geographical subspecies through isolation in island groups is a complex one and requires adequate material from all intermediate points for its solution.

Specimens examined: 22 individual rearings, 233 adults, 320 larvae, 123 pupae.

Biology.—T. solomonis is a general breeder in small natural and artificial containers. On Guadalcanal larvae have been collected in tree holes, papaya stumps, bamboo stubble, and various artificial containers, such as large and small tin cans, oil drums, lister bags, and water collections in canvas. Frequently the water in these breeding places is extremely foul and contains large amounts of decaying organic matter. It is in this type of breeding place that the larvae appear to develop in largest numbers. There are no records of this species breeding in leaf-axils of plants. The larvae have the usual *Tripteroides* habit of resting on their backs on the bottom of their breeding places. They are noted for their sluggish wriggling movement. When disturbed they back away, remaining on their backs. The aquatic cycle, under laboratory conditions, requires about two and a half or three weeks. In comparison with the size of the adults and larvae, the pupae are disproportionately large. There is little seasonal variation in abundance of this species since moderate rains usually maintain enough water in breeding places.

In the field the larvae are easily recognized by their short, stubby white bodies densely covered with stellate tufts. In tree holes a red pigment is deposited in the fat bodies of the larvae, giving them a purplish-red coloration. *T. lipovskyi* and *binotata* have larvae of a similar appearance, but these can usually be distinguished by even stubbier bodies and a greater development of stellate tufts.

The adults are frequently collected attempting to bite during the day in the vicinity of their breeding places. They may become a serious pest around human dwellings, where artificial containers are allowed to accumulate water and are not oiled. They are readily attracted to lights and were frequently collected in routine night hand-catches on Guadalcanal. On this island *solomonis* was collected only along the coast and never far back in the jungle. In common with *atripes* and *punctolateralis*, this species appears to be semidomestic. As it enters dwellings and readily takes human blood, it is a potential pest and should be controlled. No information is available on its relationship to disease transmission.

T. solomonis has been found associated with *T. stonei* in bamboo stubble; with *T. lipovskyi* in bamboo stubble, tree holes, and artificial containers; with *T. binotata* and *T. torokinae* in tree holes; and *Aedes quasiscutellaris* Farner and Bohart, *A. albolineatus* (Theobald), *A.*

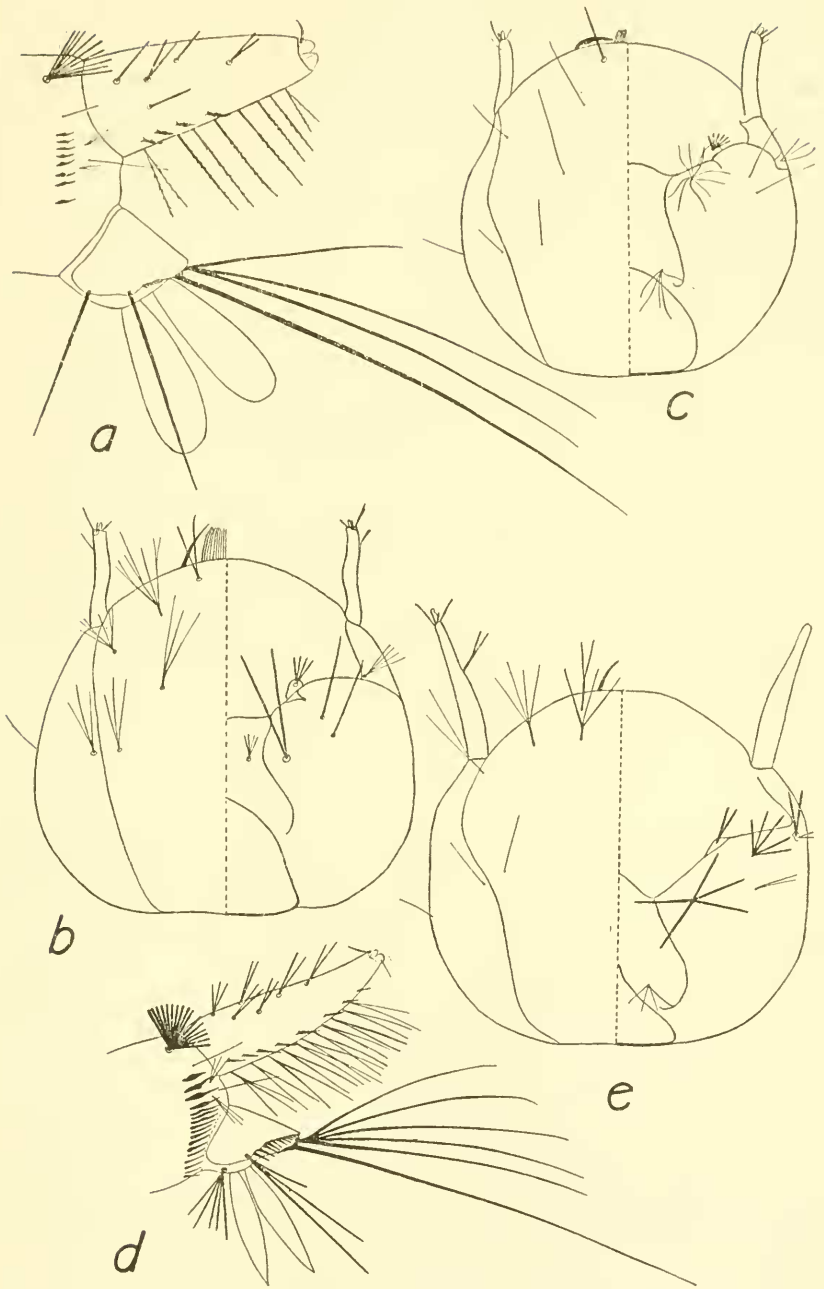

FIGURE 36.—*a*, Larva of *Tripteroides coheni*, new species, terminal abdominal segments; *b*, same, dorsal (left) and ventral (right) aspects of head; *c*, larva of *T. lipovskyi*, new species, dorsal (left) and ventral (right) aspects of head; *d*, same, terminal abdominal segments; *e*, larva of *T. solomonis* (Edwards), dorsal (left) and ventral (right) aspects of head.

albilabris (Edwards), *Culex* (*Lophoceraomyia*) sp., *Culex* (*Culiciomyia*) sp. in tree holes on Guadalcanal. Edwards (1926) reports a series of adults of this species reared from larvae collected in a coconut husk, in company with *Aedes argenteus* (=*aegypti* (Linnaeus, *A. variegatus* (probably=*quasiscutellaris*), and several other species in the Florida group. Paine and Edwards (1924) record *solomonis* from coconut husks in association with *Aedes variegatus* (probably *quasiscutellaris* Farner and Bohart), *Armigeres malayi* (probably *breinli* Taylor), and *Aedes albolineatus* (Theobald) in the Russell group.

Distribution.—Solomon Islands: *Guadalcanal:* Generally distributed on the north and northwest coasts (JNB et al., A. B. Gurney, J. G. Franclemont, D. E. Beck et al., P. W. Oman) [U.S.N.M., CU, JNB]. *Florida:* Tulagi [*as* Guadalcanar] (A. G. Carment), Edwards (1924); Port Purvis, Gela (C. H. G. White), Edwards (1926); Siota (K. L. Knight [U.S.N.M.]. *Russell:* Ufa, Fai-ami (Paine), Paine and Edwards (1929). *New Georgia:* Segi Point (C. O. Berg) [U.S.N.M.]; Munda (J. G. Franclemont) [U.S.N.M., CU, JNB]. *Bougainville:* Empress Augusta Bay (A. B. Gurney, C. R. Bruck) [U.S.N.M.] *Treasury:* [U.S.N.M.]; Sterling Island (J. H. Paullus) [U.S.N.M]. "*Solomon Is.*" (R. B. Eads) [U.S.N.M.].

New Caledonia: APO 502 [U.S.N.M.].

TRIPTEROIDES (MIMETEOMYIA) COHENI, new species

Figures 33, *g*; 34, *d*; 36, *a*, *b*; 37, *e*

Distinctive characters.—Adults: Unornamented. Outstanding wing scales all narrow on dorsal surface of veins. Proboscis 1.4 as long as front femur in the male, 1.2 in the female, very slender and longer than the abdomen in both sexes. Male palpi 0.85 of proboscis, female palpi 0.15. Scutal vestiture dense, shaggy; one pair of anterior dorsocentrals; three or four pairs of prescutellars; one strong posterior pronotal. Abdomen dark dorsally, except for inconspicuous, partially white lateral margins; venter light. Pleura almost completely covered with light scales.

Larvae: Maxilla with three strong apical spines, the largest of these is about half as long as the body of the maxilla. Thorax without spines, with conspicuous stellate tufts. Abdomen with two or three pairs of dorsal stellate tufts per segment. Comb teeth in a single row, seven or eight in number. Siphon dark, with lateral and dorsal spikes, index 2.5. Pecten of three or four fringed teeth. Ventral brush of anal segment a single pair of hairs arising from the saddle.

Description of male.—Wing: 3–4 mm.

Head: Proboscis very slender, 1.4 as long as front femur, slightly longer than abdomen, dark-scaled. Palpi approximately 0.85 as long

as proboscis, dark-scaled, very slender, with a few short dark bristles on last two segments. Clypeus brown, bare. Antenna 0.70 as long as proboscis; torus brown, bare; flagellar whorls very dense; last two segments elongate, with dense pubescence, penultimate segment twice as long as terminal. Vertex clothed with broad, appressed, dark scales except for a narrow light line along eye margins and a pair of lateral white patches; erect occipital scales short, white in the center, dark laterally.

Thorax: Scutal integument dark brown, thick shaggy vestiture of mixed broad and narrow, curved, appressed, dark bronzy scales, a few narrow white scales on anterior promontory; one pair of anterior dorsocentral bristles, acrostichals absent; three or four pairs of large prescutellars; numerous bristles on anterior promontory and supraalar areas; all bristles dark brown. Scutellum dark, completely covered with very broad, appressed, flat, dark-bronzy scales; bristles dark brown. Postnotum brown, darker centrally, bare. Pleural integument brown; upper part of propleuron, lower anterior part of sternopleuron, middle posterior part of mesopleuron, meron and metameron bare; pronotal lobe and posterior pronotum white-scaled at base, upper half to two-thirds dark-scaled; remainder of pleura completely covered with broad, appressed, translucent white scales. Pleural bristles: anterior pronotals about six strong dark bristles; one strong dark posterior pronotal; spiraculars two to four dark bristles; propleurals four to six light hairs; lower sternopleurals several light hairs; upper sternopleurals one or two light hairs; prealars usually four dark bristles and a few light hairs; upper mesepimerals a group of light hairs. Halteres light on base and lower part of stem, upper part of stem and knob dark-scaled.

Wings: Scales all dark. Outstanding scales on all veins beyond 1 narrow. Bases of fork cells approximately equidistant from wing base. Fringe mostly dark. Squama fringed.

Legs: All dark-bronzy except for white-scaled coxae and trochanters and light-scaled ventral surfaces of femora, tibiae, and tarsi. Enlarged claw of front tarsus with a tooth near the middle, that of middle tarsus simple. Apex of hind tibia and base of first hind tarsal segment with specialized hairs and scales. Hind tibia approximately 0.85 of middle tibia.

Abdomen: Dark iridescent bronzy dorsally; ventral surface a dingy yellowish white; lateral areas of tergites with mixed pure white and dark scales. First tergite with numerous light hairs; eighth segment with numerous dark bristles; sternites moderately hairy, more so on apical segments.

Genitalia (figs. 33, *g;* 34, *d*): Sidepiece conical, densely covered with scales laterally and ventrally, dorsal surface with bristles only,

bristles present on basal portion; basal lobe with six strong bristles; clasper long, slender, apical half with several short hairs, especially on upper surface, terminal spine short, deeply inserted. Mesosome simple, short and broad; composed of two lateral plates, each with an apical ventral spur and two dorsal projections. Tenth sternite ending in about four spines. Ninth tergite with a deep emargination in the middle, somewhat narrower than one of the lobes; lobes rounded, with eight or nine strong bristles arranged in an irregular double row on the apex.

Female.—Very similar to the male, except for sexual characters. Terminal antennal segments not elongate. Proboscis 1.2 as long as front femur. Palpi 0.15 as long as the proboscis. Ventral abdominal coloration pure white.

Pupa (fig. 37, *e*).—Cephalothorax: Dorsal surface and basal portions of wing cases moderately pigmented; remainder lighter. Trumpet darkly pigmented throughout, uniformly reticulate; index of length to median width about 4 : 1; somewhat swollen in the middle and compressed laterally beyond middle to apex; inner wall well separated from outer in basal half; opening narrow, elongate, oblique, basal notch deep and narrow. Hair 1 very long, double from base, one of branches with shorter secondary branch; hairs 2 and 3 short but conspicuous, 2 usually simple, 3 double or simple; 4 and 5 short, branched, equal in size; 6 and 7 equal in size, slightly shorter than 2 and 3, 6 unpigmented, 7 dark; 8 and 9 about equal in size and as long as trumpet, simple or double; 10 about half of 11, with three or more branches; 11 and 12 long, simple.

Abdomen: Moderately and uniformly pigmented on basal segments, posteriorly lighter. First segment: float hair well developed, somewhat flattened, majority of branches arising in one plane; hairs S, T, U not separated as a group, placed near the others; H, L, U very short, not pigmented; M moderately long, branched; K, S, and T simple, long, K the longest. Hair B (8) very long and simple on segments IV, V, and VI, usually not reaching apex of following segment, but extending beyond its middle, inserted near apical margin of segments; on segments II and III considerably shorter, simple; on segment VII very short, branched. Hair C (10) inconspicuous, usually branched, better developed on anterior segments. Hair C′ simple, removed about one-fourth to one-third from apex of segments, poorly pigmented; inserted laterad of or at the same level as C on all segments, best seen on anterior segments. Hair A small, unpigmented, but easily seen on segments II to V; on VI much longer, pigmented, usually with one or more branches, inserted away from margin; on segments VII and VIII a large fan-shaped tuft with barbed branches, that of VIII extending beyond apex of paddles. Hair A′ on segment VIII extending

less than one-third of paddle. Hair 2 of segment II very long, stout, pigmented, usually about twice as long as B, inserted at about apical fourth, distad of hair A; most conspicuous hair of this segment.

Paddles rather short, without marginal fringe or apical hair; midrib poorly sclerotized and evanescent beyond middle; roughly triangular, apex at end of midrib rounded; inner half of paddle about half as wide as outer.

Male genitalia: Genital lobes extending to about eight-elevenths of paddles, slightly longer than wide; curved laterally, rounded at apex. Anal lobe (segment IX) extending about one-half to two-thirds of genital lobes; broadly rounded and much narrower than genital lobes.

Female genitalia: Genital lobes and anal lobe approximately the same length and width, extending less than half length of the paddles.

Larva (fig. 36, *a*, *b*).—Head (fig. 36, *a*): Slightly wider than long, lightly and uniformly pigmented. Antenna very short, somewhat curved near the middle and slightly swollen, smooth; shaft hair short, simple, placed at two-thirds from base. Dorsal head hairs very slender and practically invisible: A short, multiple, with secondary branching; B longer, multiple, with secondary branching; C usually with three branches; d double or triple; e and f usually triple. Ventral head hairs well developed, conspicuous: postmaxillary longer than antenna, simple or double; postmandibular and infraorbital long, simple; others multiple. Clypeal spines long and slender. Maxilla normal, not elongate; three teeth on apex on inner surface, the larger tooth slightly less than half the length of the body of the maxilla; inner surface of maxilla with a fringe of small spines; outer apical angle with numerous long hairs. Labral tuft very large.

Thorax: Without spines or thickened hairs. Prothorax with poorly developed dorsal stellate tuft group: 3-branched tuft anteriorly, 2-branched posteriorly, a single spike in between. Mesothorax with a 4-branched stellate tuft. Metathorax with 5- or 6-branched stellate tuft. In addition a pair of 4- or 5-branched stellate tufts on prothorax and metathorax dorsolaterally.

Abdomen: First three abdominal segments with two pairs of dorsal stellate tufts, posterior pair better developed; segments IV to VII with three pairs of stellate tufts, the anterior pair smaller. Other stellate tufts laterally and ventrally. All the stellate tufts with slender, minutely barbed branches. Dorsolateral hair of I and II 2- or 3-branched, lateral hair simple; lateral hair of III and IV usually double; of V usually long, simple; of VI and VII short and simple. Eighth abdominal segment with a comb of seven or eight scales arising independently in a single row; individual scales sharply pointed, not toothed or fringed. Pentad hairs well developed: Hair 1 a large stellate tuft of about nine spikes, 2 long and simple; 3 triple or multiple,

short; 4 long and simple; 5 short, 2- or 3-branched. Siphon very heavily pigmented; index about 2.5; ventral surface straight, dorsal curving from near base to apex, apex about two-fifths of base; five or six single or double spikes laterally and dorsally on each side of the siphon; 9 to 13 ventral barbed hairs, basal pair usually double or triple, remainder in irregular row, usually simple; a strong apicodorsal hair; ventral siphonal valve hair minute, simple. Pecten of three or four fringed teeth in basal half. Anal segment with large dark incomplete saddle; posterior margin of saddle with minute serrations; saddle hair simple, stout and barbed; ventral tuft of anal segment reduced to a single pair of stout hairs arising from lower posteroventral margin of saddle; gills longer than anal segment, stout, rounded on apices; ventral hair of dorsal brush simple, dorsal tuft usually 3-branched.

Types.—U.S.N.M. No. 59089 (holotype and allotype):

Holotype ♂ (939–32), with larval and pupal skins, bred from larva collected in tree hole, White River Valley, Guadalcanal, April 7, 1945 (M. Cohen).

Allotype ♀ (922–2) bred from pupa collected in hollow tree stump, White River Valley, March 21, 1945 (M. Cohen, Winkler).

Paratypes (2 ♂, 2 ♀): 1 ♀ (939–31), with larval and pupal skins, same data as holotype; 2 ♂ (922–201, 202), with larval and pupal skins, 1 ♀ (922–2), same data as allotype. Paratypes to be deposited in the collections of Cornell University and the Council for Scientific and Industrial Research, Canberra, A.C.T., Australia.

This species is named for its collector, Murray Cohen.

Taxonomic discussion.—On the basis of the exclusively narrow wing scaling, long slender proboscis, and unornamented legs of the adults, *T. coheni* falls within the limits of the *caledonica*-group of the subgenus *Mimeteomyia* and most closely resembles *argenteiventris* (Theobald) and *atra* (Taylor). On the other hand, the larval characters of this species are unique and place it in an intermediate position between the subgenera *Rachisoura* and *Mimeteomyia.* The larval maxilla of *coheni* has three apical spines, one of which is rigid and the others articulated. One of the articulated maxillary spines is almost half as long as the body of the maxilla, which is considerably wider than long. All the described larvae of the subgenus *Rachisoura* have the largest maxillary spine at least three-fourths as long as the body of the maxilla, which is much enlarged and at least as long as broad, usually considerably longer. None of the described larvae of the subgenus *Mimeteomyia* have spines of any sort on the apex of the maxilla, which is short and considerably wider than long.

Brug (1934) pointed out that Edwards's (1931) division of *Tripteroides* into subgenera was not adequate, as certain species fall into one

subgenus in the adult stage and into a different subgenus on the basis of larval characters. Lee (1946) redefined the subgenera to correct this. It would appear that his groupings are natural ones, but, of course, one would expect to find some overlapping between characters of subgenera. The present species is one of these links and indicates the close resemblance of members of the subgenera *Rachisoura* and *Mimeteomyia*. As our knowledge of the genus *Tripteroides* is still very fragmentary and many forms are still unknown in the larval stage, the author prefers to assign *coheni* to the subgenus *Mimeteomyia* for the present.

T. coheni could be confused only with *argenteiventris* and *atra* in the adult stage. It differs in the possession of a pair of anterior dorsocentral bristles, which are absent in the other two species. Female *argenteiventris* are also distinguished by the short palpi, about one-tenth of the proboscis. Other members of the *caledonica*-group are strikingly different from *coheni*. *T. tasmaniensis* (Strickland) has white-tipped femora and tibiae and pale hind tarsi; *caledonica* (Edwards) and *rotumana* (Edwards) have the pleural scaling restricted to longitudinal stripes; and *collesii* Lee has the venter banded with dark scales.

The larva of *coheni* is very distinct from any other previously described species of the genus. Especially characteristic is the single ventral hair arising on each side from the saddle of the anal segment. No other species of *Tripteroides* is known with the ventral brush reduced to less than two branches or arising from the saddle.

Variation.—There is little departure from the type description in the six specimens from Guadalcanal. Specimens from the eastern tip of New Georgia and from Sterling Island in the Treasury Islands also conform very well with the types.

Specimens examined: 4 individual rearings, 8 adults, 6 larvae, 4 pupae.

Biology.—The larvae of this species were collected only twice in the course of the mosquito survey of Guadalcanal. One collection was made in the hollow stump of a tree recently cut and containing clear water with an odor of fermenting material. The other collection, in the same locality, came from a tree hole with turbid water. Both collections were made in second growth jungle surrounding a small river. Very few larvae were obtained, and no other mosquitoes were associated with this species. Repeated searches for additional material in the same locality failed to reveal this species. No adults were collected.

In the laboratory, the larvae exhibited the behavior characteristic of other species of *Tripteroides* in that the greater portion of the time they rested on their backs on the bottom of the rearing containers.

They were not seen to feed on each other and were successfully reared on artificial media. Their appearance suggests *stonei* and *mathesoni* larvae, for their bodies are white, elongate, and inconspicuously, although strongly, stellate.

Distribution.—Solomon Islands: *Guadalcanal:* White River Valley (M. Cohen, Winkler) [U.S.N.M., CU, JNB]. *New Georgia:* Segi Point (C. O. Berg, No. 168) [U.S.N.M.]. *Treasury:* Sterling (K. L. Knight, No. 861) [U.S.N.M.]

TRIPTEROIDES (TRIPTEROIDES) LIPOVSKYI, new species

Figures 33, *h*, *j*; 34, *a*; 36, *c*, *d*; 37, *a*, *b*

Rachionotomyia quasiornata Edwards, 1926, p. 109 (1 female, Marovovo Village, Guadalcanar, October 1, 1925).
T. (*T.*) *quasiornata* (in part) Edwards, 1932, p. 79.
Tripteroides quasiornata, Knight, Bohart, and Bohart, 1944, p. 18.

Distinctive characters.—Adults: Head with azure scales uninterrupted centrally. Front and middle femora with silvery spots and golden or silvery line. Thoracic integument orange; dorsocentral bristles present; scutal vestiture of narrow, dark scales only, in sharp contrast to integument; abdomen with lateral silvery markings.

Larvae: Maxilla normal, without apical spines. Mesothorax with a pair of simple spines; metathorax with pair of trifid spines. Stellate tufts numerous, heavily pigmented. Comb scales very numerous, set close together, almost meeting on ventral surface. Siphon index about 4; 12 to 14 dorsal tufts, mostly 2-branched; 9 to 13 ventral tufts, usually double. Pecten of about seven simple teeth.

Description of male.—Wing: 3–3.5 mm.

Head: Proboscis 1.3 of abdomen and almost 1.5 of front femur; very slender, dark-scaled. Palpi extremely short, projecting beyond clypeus for less than half its length, about 0.05 of proboscis; basal segments light brown, terminal dark with light hairs. Clypeus yellowish brown, bare. Antenna barely half as long as proboscis; torus orange, with a few light hairs; first flagellar segment with a few dark scales; flagellar whorls sparse; terminal segments subequal, slightly more than twice as long as the other segments, with dense pubescence. Vertex clothed with broad appressed scales; azure blue on anterior two-thirds expanded laterally; black posteriorly; erect occipital scales all dark, rather long.

Thorax: Integument yellow-orange. Scutal vestiture of sparse, appressed, very slender, hairlike, bronzy-black scales in sharp contrast to integument; three or four pairs of dorsocentral bristles, most anterior pair near border of posterior pronotum; usually two pairs of prescutellars; numerous bristles on anterior promontory and supra-alar areas. Scutellar lobes sparsely covered with broad, appressed,

dark scales. All bristles dark brown. Postnotum orange, central portion brown; bare. Pleural integument yellow-orange except for dark brown postspiracular area, upper and lower posterior part of sternopleuron, and meron; pronotal lobes with short, broad, appressed dark scales on posterior face and a few narrow, dark appressed scales along outer anterior face; posterior pronotum with sparse vestiture of narrow, appressed dark scales on upper portion, a few broad scales frequently present; dark portion of sternopleuron with broad appressed silvery scales; variable portion of mesopleuron with similar but translucent scales; rest of pleura without scales. Pleural bristles: Anterior pronotals about six dark hairs; one strong posterior pronotal; usually three dark spiraculars; one strong dark propleural; lower sternopleurals a line of light hairs; prealars usually three dark hairs; upper mesepimerals a group of light hairs; other bristles absent. Halteres light and bare at base and lower part of stem; upper part of stem and knob with bronzy, appressed dark scales.

Wings: Scales all dark. Outstanding scales small, rather narrow, especially on lower surface. Base of lower fork cell closer to base of wing than that of upper fork cell. Fringe mostly dark. Squama fringed.

Legs: Coxae and trochanters light, with translucent, broad, appressed, silvery scales. Rest of legs dark with purplish gloss, except for following markings: Front femora with preapical silvery spot at about 0.85 from base, a median silvery spot at about 0.62, and a golden line from base to about middle on lower anterior surface; middle femora with preapical silvery spot at about 0.90, a median silvery spot at about 0.58, and a silvery line of variable length and width from base to near middle on anterior surface; hind femora as the middle except that basal light line is absent and silvery spots are connected with the light scaling of the ventral surface; all femora light scaled ventrally. Ventral surface of tibiae with some light scales; hind tibia and base of first hind tarsus with specialized hairs. Enlarged claw of front leg with a tooth beyond the middle; simple on middle leg.

Abdomen: Dark iridescent above with silvery markings; segment II with large, lateral silvery spot expanding posteriorly; segments III to VII with apical silvery bands interrupted in the middle; venter golden yellow.

Genitalia (figs. 33, *h*, *j*; 34, *a*): Small, inconspicuous, retracted into eighth segment, light colored on apex. Sidepiece (fig. 34, *a*) short, broad, densely covered with scales laterally and ventrally; dorsal surface with bristles only, bristles absent on basal half; basal lobe arising at about middle of sidepiece, with about six large bristles and smaller hairs at the base. Clasper long, fairly broad; apical third with numerous small hairs; terminal spine short, rounded at apex. Meso-

some broad, large in comparison with sidepiece, simple; composed of two lateral plates, each with two dorsal projections and a ventral apical spur. Tenth sternite (fig. 33, *j*) ending in two or three strong teeth, occasionally only one present. Ninth tergite (fig. 33, *h*) with long, slender lateral lobes expanded at tip, bearing about 16 spines; four to six spines stronger than others, on dorsal surface; emargination as figured.

Female.—Very similar to the male except for sexual differences. Proboscis 1.2 of abdomen, 1.3 of front femur. Palpi as in male. Silvery coloration on abdominal tergite II more extensive, produced mesad apically.

Pupa (fig. 37, *a*, *b*).—Cephalothorax (fig. 37, *a*): Dorsal surface, wing covers, leg sheaths darkly pigmented; rest yellowish. Trumpet darkly pigmented throughout, uniformly reticulate, except for a few ridges at base; index of length to median width approximately 5 to 1, width more or less uniform; inner wall well separated from outer in basal half; opening small, oblique. Hair 1 very long, usually double from base; 2 usually 2-branched, 3 usually 4-branched, both well developed, conspicuous, about one-third length of 1; 4 long, almost one-half of 1, with three or four branches; 5 shorter, multiple; 6 very short, double; 7 long, double or triple; 8 double, longer than trumpet; 9 shorter, double; 10 short, triple or multiple; 11 long, simple; 12 also long, usually double.

Abdomen (fig. 37, *b*): Darkly pigmented, anterior segments darker; lateral portions of posterior segments yellowish. First segment: float hair well developed, not flattened at all, branches arising in all directions; hairs H, L, and U minute; K, S, and T long, simple; M multiple, fairly long. Hair B (8) very long and simple on segments II to VII, usually exceeding the distal margin of following segment. Hair C (10) much shorter, multiple, reduced in size on terminal segments; C′ short, simple, placed approximately one-fourth to one-third from distal margin of segments, well mesad of C. Hair A very minute, placed laterally at about level of C′ on segments II to VI; on segments VII and VIII a large fan-shaped tuft with barbed branches, that of VIII extending beyond apex of paddles. A′ on segment VIII long, extending more than half length of paddles. Hair 2 on segment I, extremely long, much longer than B, inserted at about middle of segment. Paddle short, without marginal fringe or apical hair; midrib sclerotized except at apex; outer portion extended and rounded before the midrib; inner portion very narrow, less than third of portion laterad of midrib.

Male genitalia: Genital lobes about half as long as the paddles, narrowed at apex to one-half the width at base, lateral margins straight, apex rounded; anal lobe (segment IX) rounded at apex, about three-fourths as long as genital lobes.

Female genitalia: Genital lobes about as long as the anal lobe, but slightly wider at apex; a little less than half as long as the paddles.

Larva (fig. 36, *c*, *d*).—Head (fig. 36, *c*): A little wider than long, uniformly light brown. Antenna very short, smooth, curved, concave on outer surface; shaft hair short, inserted near apex on outer surface. Dorsal head hairs all simple, smooth, slender; arranged as shown on figure. Ventral head hairs better developed; postmaxillary and basal maxillary with several branches; submental multiple, arising near posterior margin of submentum; basal 2- or 3-branched; subbasal and infraorbital long, simple. Clypeal spines strong, curved inward near base, swollen in the middle, slender at apex. Mouth parts normal. Labral tuft large.

Thorax: Numerous stellate tufts on dorsal, lateral, and ventral surfaces; tufts arising from distinct basal tubercles; 20 to 30 heavily pigmented barbed spikes in each tuft, spikes emarginate at apex, ending in two sharp points. Prothorax with six pairs of stellate tufts dorsad of pleural hairs; hairs 1 to 3 arising from common tubercle, hairs 1 and 3 stellate tufts, 2 simple; hairs 4, 7, 8, and 0 stellate tufts. Mesothorax with two pairs of stellate tufts dorsad of pleural groups (hairs 1 and 8); hair 7 thickened, forming a spine, usually simple, barbed, occasionally bifid. Metathorax with a trifid spine arising from a large tubercle (hair 7), the smallest spine about one-third of largest, middle one-half to two-thirds; four pairs of stellate tufts (hairs 1, 3, 5, 8).

Abdomen (fig. 36, *d*): With numerous stellate tufts on segments I to VII, each tuft with 20 to 30 heavily pigmented barbed spikes as on thorax; dorsally each segment with two pairs of equally well developed tufts per segment. Segment VIII with a comb of about 25 spines on each side, usually ringing the segment ventrally; dorsal spines short, somewhat curved, succeeding teeth longer, straighter, set close together, becoming shorter toward ventral surface. Pentad hair 1 a strong stellate tuft; hair 2 long, simple; 3 short, 3- to 6-branched; 4 long, simple; 5 long, 3- to 5-branched. Siphon uniformly pigmented a light brown except at base, which is black; index about 4; ventral surface convex; dorsal surface convex at base, slightly concave beyond the middle; apex about two-fifths of base; dorsal and dorsolateral surfaces with 12 to 14 spines, mostly 2-branched, occasionally simple or 3-branched; 9 to 13 ventral tufts, basal often 3-branched and paired, others usually double and in a single, somewhat irregular row. Pecten of about seven simple spines on each side. Anal segment with large incomplete dark saddle; posterior border of saddle with about 10 long spines; saddle hair long, with three or four branches; ventral tuft short, with 6 to 10 branches; ventral hair of dorsal brush simple, dorsal tuft usually 5- or 6-branched. Anal gills longer than segment, pointed.

Types.—U. S. N. M. No. 59090 (holotype, allotype, and paratypes): Holotype ♂ (726–31) and allotype ♀ (726–33) with larval and pupal skins, bred from larvae collected in tree hole, Sprague Swamp, Bunina, Guadalcanal, November 13, 1944 (L. J. Lipovsky, M. Cohen, A. W. Barnes).

Paratypes (27 ♂, 28 ♀) all bred from larvae collected in various breeding places on Guadalcanal, as follows: 2 ♀ (19–21, 23) with larval and pupal skins, 5 ♂, 4 ♀ (18), from tree holes, Still River, Doma Cove, October 25, 1943 (JNB); 1 ♀ (133), from oil drum, Kukum, January 5, 1944 (L. J. Lipovsky); 3 ♂, 4 ♀ from tree hole, Tassafaronga, January 27, 1944 (JNB); 4 ♂, 1 ♀ (226), in tree hole, Tandonu Swamp, Tassafaronga, February 23, 1943 (S. B. Civinski); 1 ♂ (348–21) with larval and pupal skins, from hole in pandanus tree, Aruligo River, May 5, 1944 (JNB); 1 ♂ (354–211) with larval and pupal skins, from bamboo stubble, Wright's Creek, Matanikau Valley, May 6, 1946 (L. J. Lipovsky); 1 ♀ (594–3), from hole in stump, Kokumbona, August 11, 1944 (J. J. Cuccio, E. J. McCormick, Jr.); 1 ♀ (643–3) from coconut shell, Mamara Swamp, September 7, 1944 (F. B. Wysocki, V. R. Roa); 3 ♂ (669-22, 23, 24) with larval and pupal skins, 1 ♂ (669–2), from coconut shells, Mamara Swamp, October 4, 1944 (F. B. Wysocki, V. R. Roa); 1 ♀ (726–32) with larval and pupal skins, 2 ♂ (726–3), same data as holotype and allotype; 4 ♀ (729–4) from tin cans, Lunga Valley, November 14, 1944 (M. Cohen); 2 ♂ (737–25, 27), 5 ♀ (737–21, 23, 24, 26, 28) with larval and pupal skins, 3 ♂, 1 ♀ (737–2) from tree hole, Sprague Swamp, Bunina, November 15, 1944 (JNB, M. Cohen); 2 ♂, 2 ♀ (870–3) from tin cans, Burns Creek Valley, Lunga, February 17, 1945 (F. B. Wysocki, E. J. McCormick, Jr.).

Named in honor of Louis J. Lipovsky, who first collected this species.

Taxonomic discussion.—*T. lipovskyi* is a typical member of the *nitidoventer*-group of subgenus *Tripteroides*, which includes 11 described species in the Australasian region. The *nitidoventer*-group is characterized as follows: at least one pair of dorsocentral bristles, scutal scales mostly narrow, white scales of pleura and abdomen silvery, femora usually spotted, head usually azure blue in front.

T. lipovskyi can be confused only with *nissanensis* Lee and *quasiornata* (Taylor), as these are the only described species in the subgenus that have light scutal integument with narrow dark vestiture, the pronotal lobes with broad scales, the posterior pronotum mostly with narrow scales, and the lower fork cell nearer to the wing base than the upper. *T. nissanensis* is immediately separated by the male ninth tergite with short broad lobes. *T. quasiornata* males and females and *nissanensis* females cannot be separated at present from *lipovskyi*.

The larvae of only six Australasian species are known in this group

outside of the Solomons. *T. alboscutellata* Lee and *purpurata* (Edwards) are distinct in the possession of lateral sclerotized comb-plates on the eighth abdominal segment. The larvae of the remaining four species are extremely similar to *lipovskyi*. Those of *brevipalpis* Brug can be separated by the bifid dorsal head hairs. *T. quasiornata* is distinguished by the 5- or 6-branched dorsal tufts on the siphon. Having no material for comparison with *nissanensis* and *bimaculipes* (Theobald), I can find no reliable distinguishing characters for these two species, although they seem to differ in minor details according to published figures and descriptions (Lee, 1946).

To summarize, the adults of *lipovsky* resemble most closely those of *quasiornata*, while the larvae are very similar to those of *bimaculipes* and *nissanensis*. *T. bimaculipes* adults are easily distinguished from *lipovskyi* by their dark thoracic integument.

In the Solomons, adults of *lipovskyi* are readily separated from the other two members of the *nitidoventer*-group now know by the absence of broad dark scales in front of the wing roots. The larvae of *lipovskyi* and *binotata* are extremely similar, and I can find no reliable characters to separate them. *T. distigma* (Edwards) is unknown in the larval stage.

In all probability many additional forms in this group await discovery in the Australasian region. Until more are described, it is impossible to state definitely the interrelationships of the forms known at the present time.

Variation.—The type series from Guadalcanal exhibits striking lack of variation in the majority of the characters studied, although adults are available from several different habitats and were collected at different times of the year. The thoracic integument is almost invariably light orange, but occasionally dark-orange specimens are found. The posterior pronotum shows from one to several broad scales in more than half of the specimens examined. The abdominal silvery markings are also quite constant. The ninth tergite of the male shows a great deal of variation in shape and in the size and number of bristles on the lobes. It appears that the majority of species of the *nitidoventer*-group have very similar structure of this sclerite. Therefore it would seem advisable not to rely on minor differences in the ninth tergite until large series of all species are studied. In the larvae, the usual variation in the numbers of spikes in the stellate tufts is noted and the hairs of the terminal abdominal segments show some variation. No correlation could be found between any of the variations noted and the habitat.

No geographical variation of note is exhibited by this species except for a somewhat darker thoracic integument in about half the New Georgia specimens. This may be due to a certain extent to the

age of the individuals at the time they were killed. Such specimens still show the black thoracic hairs in contrast with the dark-orange integument.

Specimens examined: 24 individual rearings; 104 adults, 115 larvae, 54 pupae.

Biology.—The aquatic stages of *lipovskyi* are most commonly found in tree holes but have also been collected frequently in coconut shells, and a few times in bamboo stubble and in sago-palm leaf-axis. Not infrequently they occur in tin cans, oil drums, and various other artificial containers. Usually the breeding places are in fairly densely shaded jungle areas, but at times they are out in the open sun. Two collections were recorded from sunny beach areas, one in a hole in a pandanus, another in a shell scar in a coconut tree. The majority of tree-hole collections were made in jungle swamp areas. In such tree holes the water is usually highly colored with organic acids but is clear. In sago palms the water may contain a large amount of a viscous fluid. In tin cans and other artificial containers the amount of organic matter present is frequently very high. Old coconut shells without a trace of decaying meat are favored by this species. *T. lipovskyi* breeds throughout the year. Its aquatic cycle is much longer than that of other culicines and appears to be about the same length as that of other *Tripteroides*. The larvae have the same habit of resting on their backs as other species of this genus.

In the field the larvae are readily separated from all other species, except *solomonis*, by their short stubby bodies which are densely covered with black spines. They can usually be distinguished from *solomonis* by the darker, better developed stellate tufts and even shorter bodies. In tree holes, in particular, and in other natural breeding places, a deep purplish-red pigment is deposited in the fat bodies, imparting a very characteristic dark-red color to the larvae.

The adults seldom bite man, but they have been noted on several occasions attempting to feed on collectors in the daytime in forested swamp areas. They can be found resting on the buttresses of large trees in the jungle and have also been observed in open coconut shells. No specimens of this species were ever collected in routine night hand-catches on Guadalcanal.

T. lipovskyi has been found associated with practically every species that inhabits tree holes and artificial containers in localities where it occurs. *T. solomonis* (Edwards), *Aedes albilabris* Edwards, *A. albolineatus* (Theobald), *Culex* (*Lophoceraomyia*) sp., *Culex* (*Culiciomyia*) *papuensis*-group, and *pullus*-group are frequently found with this species, and *C.* (*Lutzia*) *halifaxii* (Theobald) was found with it once. In bamboo stubble *T. solomonis* (Edwards), *T. stonei*, and *A. albolineatus* (Theobald) were found together with *lipovskyi*. In coco-

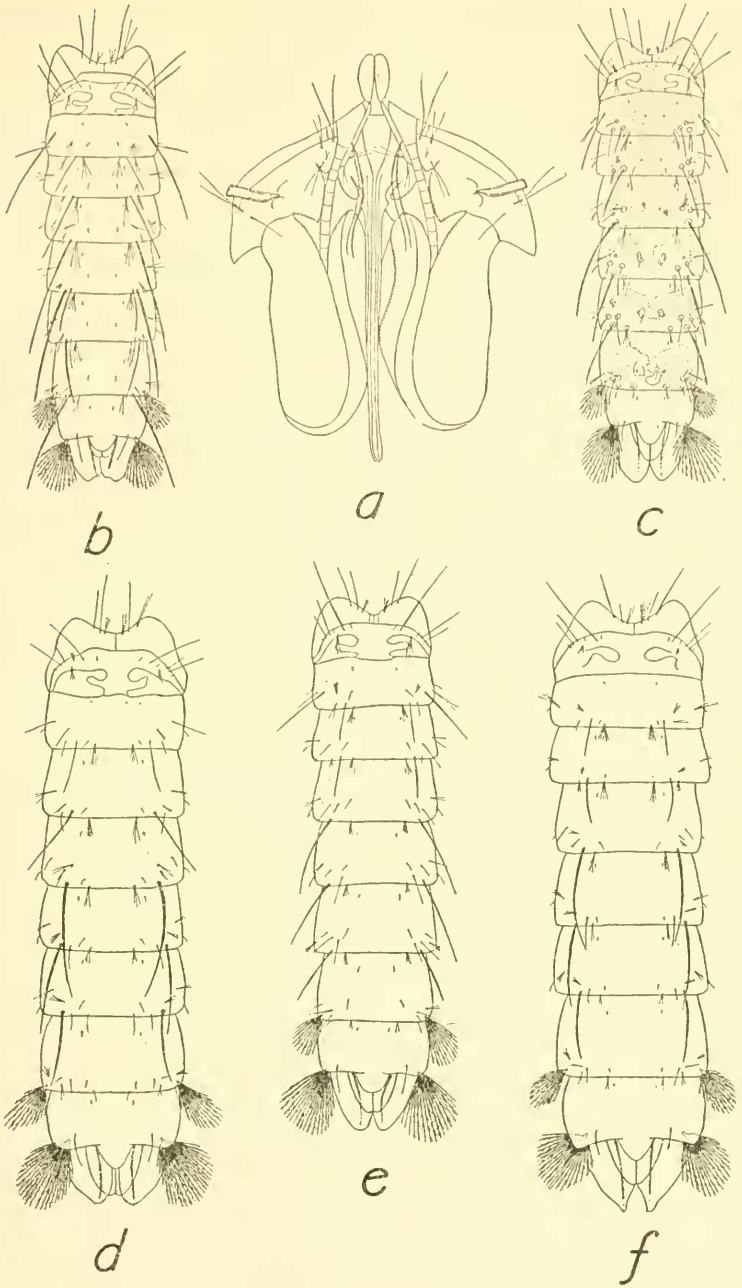

FIGURE 37.—*a*, Pupa of *Tripteroides lipovskyi*, new species, cephalothorax; *b*, same, dorsal aspect of abdomen and metanotum; *c*, pupa of *T. solomonis* (Edwards), dorsal aspect of abdomen and metanotum; *d*, pupa of *T. stonei*, new species, dorsal aspect of abdomen and metanotum; *e*, pupa of *T. coheni*, new species, dorsal aspect of abdomen and metanotum; *f*, pupa of *T. mathesoni*, new species, dorsal aspect of abdomen and metanotum.

nuts, we have collected it with *T. stonei*, *A. albolineatus* (Theobald), and *A. quasiscutellaris* Farner and Bohart.

Distribution.—Solomon Islands: *Guadalcanal:* Generally distributed on north and northwest coasts (JNB et al., P. W. Oman, K. L. Knight) [U.S.N.M., CU, JNB]. *New Georgia:* Segi Point (C. O. Berg) [U.S.N.M.]; Munda Point (J. G. Franclemont) [U.S.N.M., CU, JNB].

TRIPTEROIDES (TRIPTEROIDES) BINOTATA, new species

Tripteroides bimaculipes, Knight, Bohart, and Bohart, 1944, p. 18.

Distinctive characters.—Adults: Head with dark azure-blue scales interrupted in the center by a longitudinal dark stripe. All femora with silvery spots and golden or silvery lines. Thoracic integument brown, testaceous on lateral anterior angles; dorsocentral bristles present; scutal vestiture of narrow dark scales, patch of broad, black scales in front of wing roots. Abdomen with lateral silvery markings.

Larvae: Maxilla normal, without apical spines. Mesothorax with a pair of simple spines, metathorax with a pair of trifid spines. Stellate tufts numerous, heavily pigmented. Comb scales very numerous, set close together, almost meeting on ventral surface. Siphon index about 4; 12 to 14 dorsal tufts, mostly 2-branched; 9 to 13 ventral tufts, usually double. Pecten of about seven simple teeth.

Description of male.—Wing: 3–3.5 mm.

Head: Proboscis 1.3 of abdomen and 1.3 of front femur, very slender, dark scaled. Palpi extremely short, projecting beyond clypeus for two-thirds length of latter, about 0.06 of proboscis; dark, basal segments lighter, with numerous hairs. Clypeus yellowish to brown, bare. Antenna about half as long as proboscis; torus yellowish brown, with a few short, light hairs; flagellar whorls not very dense; first flagellar segment with a few minute, dark scales; terminal segments subequal, each slightly more than twice as long as other segments, with denser pubescence. Vertex clothed with broad, appressed scales, dark in the center, iridescent, dark azure-blue dorsolaterally on anterior two-thirds, silvery on the sides and below, dark on posterior third; erect occipital scales all dark, rather long.

Thorax: Scutal integument light orange to testaceous on anterolateral areas, dark brown to black posteriorly and centrally. Scutal vestiture of narrow hairlike scales, dark in color throughout; supraalar area darker than rest of scutum, with a large patch of broad, appressed, black scales on each side; four or five pairs of strong dorsocentral bristles; two or three pairs of prescutellars; numerous bristles on anterior promontory and supraalar areas. Scutellar lobes sparsely covered with broad, appressed, dark scales; bristles dark. Pleural integument light yellowish to testaceous, central area (sterno-

pleuron, mesopleuron, meron, postspiracular area) darker; pronotal lobes with short broad appressed dark scales on posterior face and a few narrow and broad scales on anterior face; posterior pronotum with sparse vestiture of narrow, appressed dark scales; upper and posterior half of sternopleuron and most of mesepimeron with broad appressed translucent silvery scales; rest of pleura bare. Pleural bristles: anterior pronotals about four dark hairs; one strong posterior pronotal; spiraculars usually three; one light propleural; lower sternopleurals a row of light hairs; prealars usually three short, dark bristles; upper mesepimerals a group of light hairs; other bristles absent. Halteres light and bare on base and lower part of stem; upper part of stem and knob with appressed, dark scales.

Wings: Scales all dark, outstanding scales short, rather narrow, especially on lower surface. Base of lower fork cell closer to base of wing than that of upper. Fringe dark. Squama fringed.

Legs: Coxae and trochanters yellowish, with translucent broad, appressed silvery scales. Front femora with preapical silvery spot extending to 0.88 from base, median silvery spot at 0.56, and a narrow yellowish line from base to almost middle; middle femora with small preapical and median silvery spots and a short, thin, basal silvery streak; hind femora with a large preapical silvery spot and a long, basal silvery streak extending to about the middle, both of these connected with light ventral coloration; ventral surface of all femora golden-yellow, remainder dark. Other leg segments dark except for lighter scales ventrally; tibiae light golden below. Hind tibiae and base of first hind tarsus with specialized hairs. Enlarged claw of front leg with a tooth near the middle, simple on middle leg.

Abdomen: Dark iridescent above, with silvery markings. Second segment with large triangular, lateral silvery spot extending from base to apex and prolonged mesad on apex; segments III to VII with lateral apical silvery bands, interrupted in the center. Venter golden-yellow.

Genitalia: Small, inconspicuous, retracted into eighth segment, light colored on apex. Sidepiece short, broad, densely covered with scales laterally and ventrally; dorsal surface with bristles only, bristles absent on basal half; basal lobe arising at about middle of sidepiece, with about six large bristles, smaller hairs at base. Clasper long, fairly broad; apical third with numerous small hairs; terminal spine short, rounded at apex. Mesosome broad, large in comparison with sidepiece, simple; composed of two lateral plates, each with two dorsal projections and a ventral apical spur. Tenth sternite ending usually in two teeth, but sometimes in one or three teeth. Ninth tergite with long, slender, lateral lobes expanded at tip bearing 12 to 18 spines; on dorsal surface of each lobe four or five larger spines; median emargination long, about same width as one of the lobes.

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Female.—Very similar to the male except for sexual differences. Proboscis 1.2 of abdomen, 1.3 of front femur. Silvery coloration on abdominal tergite II more extensive on apical margin of segment.

Pupa.—Unknown.

Larva.—Indistinguishable from *T. lipovskyi.*

Head: A little wider than long, uniformly tan in color. Antenna very short, smooth, curved, concave on outer surface; shaft hair short, inserted near apex, on outer surface. Dorsal head hairs all simple, smooth, slender, lightly pigmented and inconspicuous. Ventral head hairs better developed: postmaxillary and basalmaxillary with several branches; the latter often stellate; submental multiple, arising near posterior margin of submentum; basal 2- or 3-branched; subbasal and infraorbital long, simple. Clypeal spines strong, curved internally near base, swollen in the middle, slender at apex. Mouthparts normal, maxilla with dense tuft of hairs on apex. Labral tuft large.

Thorax: Numerous stellate tufts on dorsal, lateral, and ventral surfaces, tufts arising from distinct basal tubercles; 20 to 30 heavily pigmented barbed spikes in each tuft; spikes deeply emarginate at apex, ending in two sharp points. Prothorax with six pairs of stellate tufts dorsad of pleural hairs; hairs 1 to 3 arising from common tubercle, 1 and 3 stellate tufts, 2 simple; hairs 4, 7, 8, and 0 stellate tufts. Mesothorax with two pairs of stellate tufts (hairs 1 and 8) dorsad of pleural groups; hair 7 thickened, forming a simple barbed spine, occasionally bifid. Metathorax with a strong, trifid, smooth spine arising from a larger basal tubercle (hair 7), the smallest spine about one-third of largest, middle one-half to two-thirds; four pairs of stellate tufts (hairs 1, 3, 5, 8).

Abdomen: With numerous stellate tufts on segments I to VII, each tuft with 20 to 30 heavily pigmented barbed spikes as on thorax; dorsally each segment with two pairs of equally well developed tufts per segment. Segment VIII with a comb of about 25 spines on each side, not quite ringing the segment ventrally; dorsal teeth short, succeeding teeth longer, straighter, set close together, becoming shorter ventrally. Pentad hair 1 a strong stellate tuft; 2 long, simple, occasionally double; 3 short, 3- or 4-branched; 4 long, simple; 5 long, 3- to 5-branched. Siphon uniformly pigmented a light brown except at base which is black; index about 4; ventral surface convex; dorsal surface convex at base, slightly concave beyond the middle; apex about two-fifths of base; dorsal and dorsolateral surfaces with 12 to 14 spines, mostly 2-branched, occasionally simple or 3-branched; 9 to 13 ventral tufts, basal often 3-branched and paired, others usually double and in a single, somewhat irregular row. Pecten of about seven simple spines on each side. Anal segment with large incomplete saddle; posterior border of saddle with about 10 long spines; saddle hair long, with

three or four branches; ventral tufts short, with 6 to 10 branches; ventral hair of dorsal brush simple, dorsal tuft usually 5- or 6-branched. Anal gills longer than segment, pointed.

Types.—U.S.N.M. No. 59091 (holotype, allotype, and paratypes): Holotype ♂ and allotype ♀, Empress Augusta Bay, Bougainville, January 18, 1944 (C. R. Bruck).

Paratypes (23 ♂, 34 ♀): 7 ♂, 11 ♀, same data as holotype and allotype; 3 ♂, 6 ♀ (G–125), 2 ♀ (G–172), 1 ♂ (G–205), 2 ♂ (G–224); 1 ♀ (G–237), 3 ♂, 1 ♀ (G–239), 1 ♂, 3 ♀ (G–426), 1 ♂ (G–427), same locality as holotype, January, February, and July 1944 (A. B. Gurney); 4 ♂, 10 ♀, same locality as holotype, April 13, 1944 (Sgt. Scott); 1 ♂, same locality as holotype, 1944 (W. G. Downs) [U.S.N.M.].

Taxonomic discussion.—*T. binotata* is a typical member of the *nitidoventer*-group of the subgenus *Tripteroides.* It differs from *bimaculipes* (Theobald), its closest relative with dark scutal integument, in the possession of broad dark scales in patches in front of the wing roots and a central dark stripe on the head breaking the azure-blue coloration. *T. distigma* (Edwards) resembles *binotata* in having two patches of dark scales on the scutum, but it is immediately differentiated by the femoral ornamentation as well as the light scutal integument. *T. nissanensis* Lee, which may be encountered on Bougainville, and *T. lipovskyi*, from the lower Solomons, can be separated by the light integument as well as the absence of broad scales on the scutum and the head ornamentation. The male ninth tergite is indistinguishable from that of *lipovskyi.* It should be pointed out that the ninth tergite is quite similar in several other Australasian species, *bimaculipes* (Theobald) and *quasiornata* (Taylor) particularly, and is not a reliable character in this group.

The larvae cannot be separated from those of *lipovskyi.* No individual rearings were made but the association is undoubtedly correct. For the separation of *lipovskyi* and *binotata* larvae from other Australasian forms, see the taxonomic discussion of *lipovskyi.*

Variation.—Adults of this species show little variation except in the position and size of the femoral markings and the coloration of the scutal integument. In a few of the specimens examined the scutum is only indistinctly lighter in front, while in others the lighter anterior portion may be extended back to the wings. In such cases the patch of scales in front of the wing roots is very conspicuous, especially as the scales are found on a dark spot. The abdominal silvery markings are, in a few specimens, more extensive, and on the posterior segments form almost complete apical bands.

Specimens examined: 60 adults, 65 larvae.

Biology.—*T. binotata* has been collected principally in tree holes. There is one record from leaf-axils of an aroid plant (probably *Alo-*

casia or *Colocasia*) and one from a ground pool. The latter record is misleading as the larvae collected in this place probably were washed out from their real habitat. Another collection is recorded from a cardboard container. It is very likely that this species will be found to be a general breeder, similar to *lipovskyi* in its selection of larval habitats.

No information is available on the habits of the adults.

Distribution.—Solomon Islands: *Bougainville:* Empress Augusta Bay (C. R. Bruck, A. B. Gurney, W. G. Downs, Sgt. Scott) [U. S. N. M.].

TRIPTEROIDES (TRIPTEROIDES) DISTIGMA (Edwards)

Rachionotomyia distigma Edwards, 1925, pp. 257–258.
Tripteroides (*T.*) *distigma* Edwards, 1932, p. 78.
Tripteroides distigma, Knight, Bohart, and Bohart, 1944, p. 17.
Tripteroides (*T.*) *distigma*, Lee, 1946, p. 241.

Type.—♀ in house, Tulagi Florida group (Dr. A. G. Carment) [British Museum].

Distinctive characters.—Female: Head with azure scales. Middle femora with a small pale spot anteriorly, hind femora pale except for dorsal surface and anterior part of posterior surface. Thoracic integument orange; dorsocentral bristles present; scutal vestiture of straight, hairlike, greenish scales, a dark brown spot densely clothed with flat, deep black scales in front of wing root. Pronotal lobes with broad scales, posterior pronotum with a few narrow scales. Abdomen with purplish gloss, no silvery markings.

Original description.—"*Head* clothed with azure scales above, silvery below. Clypeus and tori orange. Palpi black, hardly longer than the clypeus. Proboscis black, long and slender. *Thorax* with the integument mainly orange. Anterior pronotal lobes with flat black scales; posterior pronotal lobes ("proepimera") with a few narrow dark scales. Mesonotum mainly clothed with straight hair-like greenish scales, but in front of the root of each wing is a roundish dark brown spot densely clothed with flat deep black scales. Dorsocentral bristles present (represented by scars). Three spiracular bristles. Pleurae with the usual patch of silvery scales; integument of sternopleura and lower part of mesepimera dark brown. Scutellum denuded. *Abdomen* brownish with a strong purple gloss, but devoid of silvery markings. Venter (as far as visible) golden. Legs dark brown, with a purple gloss. Femora pale beneath; mid femora with one small obscurely pale spot in the middle in front; hind femora with a dark dorsal line reaching the base, on the outer side pale golden, with the tip and a longish area beyond the middle dark. Hind tarsi with two small claws. Wings normal, outstanding scales ligulate, rather short. Wing length, 3.3 mm.

"Tulagi, in house, 1 ♀ (Dr. A. G. Carment).

"In many respects this answers to Taylor's description of *R. ornata*, but he describes the venter as 'darker than the dorsal surface, clothed with blackish-brown scales'; and does not mention any markings on the femora. The species is very distinct from all others known to the writer by the thoracic ornamentation."

Male, larva, and pupa.—Unknown.

Taxonomic discussion.—In the possession of a patch of broad scales in front of the wing root *distigma* resembles *binotata*, but the latter has different femoral ornamentation and has silvery spots on the abdomen. Greenish scutal scales are present in *purpurata* (Edwards), but this species is also amply distinct on the basis of broad scales on the posterior pronota.

There should be no difficulty in recognizing this species on the basis of the original description. As far as is known only the type female has been collected. The Florida group of islands has not been especially well collected and with diligent search this species can probably be located, especially since the adults enter houses.

There is a possibility that *floridensis* described in this paper from the larval stage is conspecific with *distigma* as it, too, has been collected only in the Florida group. The reasons leading the author to the description of *floridensis* are indicated under the discussion of that species.

Distribution.—Solomon Islands: *Florida group:* Tulagi (A. G. Carment), Edwards (1925) [type ♀].

TRIPTEROIDES FLORIDENSIS, new species

Figures 34, *e, g, h*

Distinctive characters.—Larvae: Maxilla normal, without apical spines. Mesothorax without spine, metathorax with pair of bifid spines. Stellate tufts numerous, well developed but not conspicuous, two pairs per segment dorsally on abdomen. Comb scales arising from lateral sclerotized plate, five to eight in number, very sharply pointed. Siphon index 5 : 1, six or more inconspicuous pecten teeth.

Male, female, and pupa.—Unknown.

Description of larva (fig. 34, *e, g, h*).—Head (fig. 34, *h*) : About as long as wide, uniformly yellowish. Antennae very short, smooth, narrowed at base, widest before middle; shaft hair simple, inserted on outer surface basad of middle. Dorsal head hairs all simple, smooth, slender, inconspicuous. Ventral head hairs also poorly developed: Postmaxillary short, with several branches; submental short, inserted near basal pits; others simple, basal very long. Clypeal spines slender, directed downward. Mouth parts normal; mandible with a long articulated spine at outer apex; maxilla very wide and

short, without spines. Labral tuft very large, occupying entire area between clypeal spines. Subantennal sclerite very long, the basal (subantennal) hair placed in basal half of head.

Thorax (fig. 34, *e*) : With numerous stellate hairs composed of 15 to 30 or more very light spikes in each, each spike ending in two sharp points, shafts minutely barbed. Prothorax with six pairs of stellate tufts dorsad of pleural hairs; hairs 1 to 3 arising from common basal tubercle, 1 and 3 stellate tufts, 2 simple, arising back and just mesad of 3; 4, 7, 8, and 0 stellate tufts. Mesothorax with three pairs of stellate tufts (hairs 1, 7, 8) dorsad of pleural groups; no thickened hairs or spines; hair 5 long, well developed, barbed. Metathorax with bifid spines (hair 7) arising from a large sclerotized basal plate, the small branch of spine a little more than two-thirds as long as the larger, both slender and lightly pigmented; four pairs of stellate tufts (hairs 1, 3, 5, 8). Numerous stellate tufts ventrally.

Abdomen (fig. 34, *g*) : With numerous stellate tufts on segments I to VII, each tuft with 15 to 30 or more spikes similar to those on thorax; dorsally each segment with two pairs of tufts, anterior pair smaller. Segment VIII with a pair of lateral sclerotized plates from which arise the comb teeth; five to eight comb teeth, middle teeth very long and slender, dorsal teeth shorter, more heavily pigmented, smaller ventral teeth may arise independently of plate (not more than two seen). Pentad hair 1 a large stellate tuft; 2 long and simple; 3 with about eight branches arising from the base; 4 long and simple; 5 shorter, simple. Siphon uniformly and very lightly pigmented as are all its hairs, index 5 or a little less; swollen dorsally just beyond the base, slightly concave dorsally and convex ventrally; apex narrowed to about three-fifths of base; six or seven pairs of dorsal tufts, each usually with three barbed branches; a pair of simple hairs ventrally at base, followed by about 12 midventral tufts, mostly double, occasionally triple, branches barbed; apicodorsal hair poorly developed, ventral valve hair long, simple. Pecten of six or more inconspicuous, lightly pigmented simple teeth, extending from base for more than two-thirds of siphon. Anal segment with large, very poorly pigmented, incomplete saddle; posterior border of saddle with five or six very long spines; saddle hair double; ventral tuft of five or six very short branches; ventral hair of dorsal brush simple, long; dorsal tuft usually 5-branched; all hairs with conspicuous barbs. Anal gills long, slender, rounded at apex, almost twice as long as saddle.

Types.—U. S. N. M. No. 59092 (holotype and paratypes) :

Holotype and 10 paratypes, fourth-instar larvae collected in wild banana stalk, Halavo, Florida Island, December 17, 1943 (R. L. Ingram and M. Gould : K. L. Knight Coll. No. 839).

Taxonomic discussion.—This larva is so distinct from any previously described *Tripteroides* in the Australasian region that the author believes it advisable to name it. Only two other species in this region, namely *alboscutellata* Lee and *purpurata* (Edwards), have larvae with lateral sclerotized comb plates in combination with metathoracic spines but lacking mesothoracic spines. Both of these have heavily pigmented stellate tufts characteristic of the described larvae of the subgenus *Tripteroides*. The stellate tufts of *floridensis* are so poorly pigmented that they are not obvious unless examined under a microscope. The structure of the comb teeth is furthermore very different from *alboscutellata* (about 18 blunt-ended teeth) and *purpurata* (30 or more very slender, closely set spines). The general appearance of *floridensis* larvae suggests a member of the subgenus *Mimeteomyia*. Only *atripes* (Skuse), *solomonis* (Edwards), and *punctolateralis* (Theobald) possess lateral comb plates in this subgenus. They are immediately distinguished by their mesothoracic spines. The *caledonica*-group of this subgenus shows the nearest approach to this type of larva but none of the described species have comb plates. It seems best then not to assign *floridensis* to any of the subgenera for the present.

There is a remote possibility that *floridensis* may be the larva of *distigma* (Edwards), which is known only from a single female described from the Florida group of islands. Yet *distigma* appears to be closely related to *binotata* and *lipovskyi*, both of which have typical *Tripteroides* larvae, and one would not expect such radical departure from this type of larva in a closely related species. A further possibility is that *floridensis* is not a *Tripteroides* at all but is in reality a *Harpagomyia* or a *Topomyia*. These genera are so poorly known at the present time that no definite characters to distinguish their larvae are available, but *floridensis* is amply distinct from all species whose immature stages have been described. It is hoped that further collecting and rearing of material in the Solomons will settle this question.

Biology.—Although there is little information available on the biology of this species other than the larval habitat given above for the type series, that in itself is of considerable interest. On Guadalcanal, leaf-axils of various species of wild bananas and plantains were examined frequently for mosquito larvae. None was ever found. The collection of the larvae of this species came from a single axil while a great number of others were examined without results. Examples of *Aedes albilabris* (Edwards) were also found in this axil. It is hoped that a more thorough search in these plants, as well as Heliconias, may reveal additional species of *Tripteroides* in the Solomons.

Distribution.—Solomon Islands: *Florida:* Halavo (Knight Coll. No. 839 [U. S. N. M.].

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